Electrical Review

With Which Is Consolidated WESTERN ELECTRICIAN and ELECTROCRAFT.

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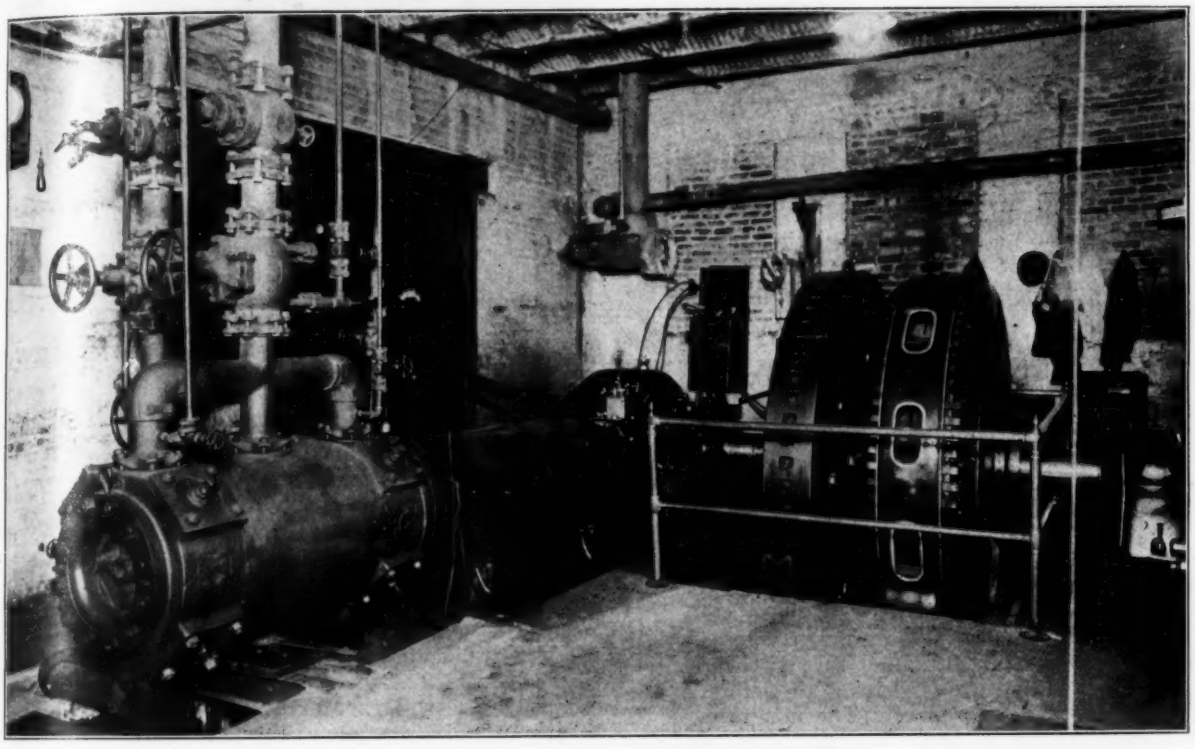


Westinghouse Alternator Converted Into 250-Kilowatt Synchronous Motor Driving De La Verne Ammonia Compressor Rebuilt from Steam Engine.

Adaptation of a Brewery to Ice-Making

Brewery Changed into a Refrigerating Plant by Converting Steam Engines into Ammonia Compressors and Generators into Synchronous Motors

THE adaptation of brewing buildings and some of their equipment to other lines of industry is being accomplished to some extent in these times of both state and federal restrictions on the manufacture and sale of alcoholic beverages. In this way large investments in such plants are conserved that otherwise would become non-productive and practically worthless.

An interesting case of this kind that may be noted is the conversion of the plant of the Gottfried Brewing Company, in Chicago, into a refrigerating establishment, wherein all the equipment is electrically driven. This plant is located at 337 Alexander Street. On one side of the street is the malting house of the Gottfried Brewing Company, still in operation, the malt product being sold to other breweries; the old brewery building, now utilized for ice-making, is on the opposite side of the street, where the cold-storage and ice-manufacturing business is carried on under the name of the Calumet Refrigerating Company.

The change at the brewery, to adapt it to ice-making, was made last winter. About two years prior to this, however, the entire industry, malting and brewing, was completely electrified. Power for this was provided for by installing two steam-driven generating units in power house of the brewery building. Within the last year it was decided to purchase electric power from the Commonwealth Edison Company, and to dispense with steam power for every purpose except heating.

The two alternating-current generators were rewound so as to convert them into synchronous motors, and the two steam engines, by which the generators had formerly been driven, were converted into ammonia compressors for ice-making.

Further details of reconstructing this part of the

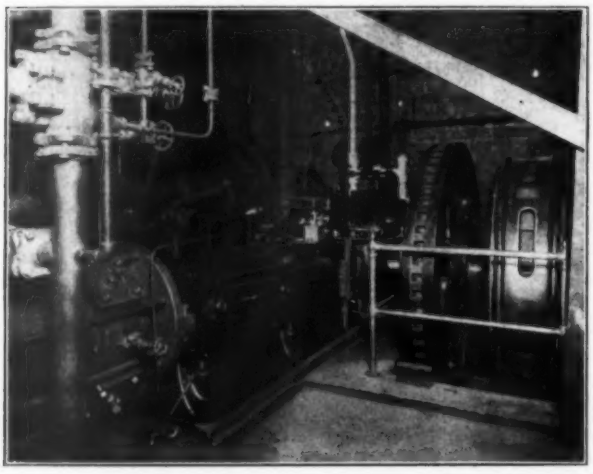
plant are as follows: One of the generators, a General Electric alternator, was made over into a synchronous motor by giving its rotor the requisite winding, and by furnishing the necessary parts on the switchboard to adapt it to the change; also, an additional oil circuit-breaker, with mechanical interlock, was put in. The motor, thus produced, is a 200-kilowatt, 240-volt, 480-ampere, three-phase, 60-cycle machine, with speed of 200 revolutions per minute. Belt-connected thereto is a 20-kilowatt, 125-volt, direct-current Fort Wayne exciter set.

The other generator, a Westinghouse alternating-current machine, was rewound in a similar manner to convert it into a synchronous motor of 250 kilowatts, 240-volts, 600 amperes, three-phrase, 60 cycles and 200 revolutions per minute. A Westinghouse exciter, belt-connected to the large motor, is a 20-kilowatt, 125-volt, 160-ampere generator, running at 200 revolutions. At present the motors are started on half-voltage taps of the main supply transformers, without the use of separate compensators.

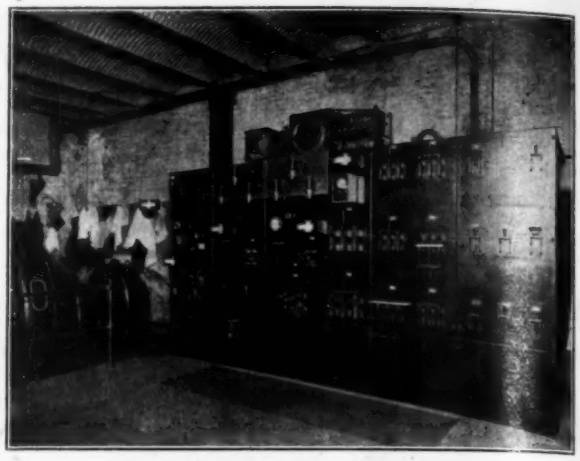
Each synchronous motor is direct-connected to an ammonia compressor which is the product of the reconstruction previously mentioned. The change consisted in taking the steam cylinder out of the engine and putting in place of it De La Vergne ammonia-compressor cylinder and necessary valve and piping equipment. The remainder of the engine—piston rod, crosshead, guides, connecting rod, flywheel, foundation—remained intact. The two ammonia compressors, thus provided, have capacities of 140 tons each, computed in tons of refrigeration.

The power supply transformers, which are owned by the Commonwealth Edison Company, consist of three 200-kilovolt-ampere units of the Pittsburgh type, which receive the current at 12,000 volts, and by which it is stepped down to 240 volts. Power from this source is distributed throughout the ice-making and malting plants, driving 40 motors, aggregating about 1000 horsepower. The motors used are of General Electric and Westinghouse makes—about one-half of each. In 1916 the consumption of electrical energy amounted to about four million kilowatt-hours, but for 1917 it will probably be considerably less.

The readaptation of steam engines to compressor purposes, as explained in this case, may prove suggestive of how idle engines in other plants might be utilized, after a small expenditure in making necessary changes.



General Electric Synchronous Motor (Formerly an Alternator) Driving a De La Verne Compressor Rebuilt from a Steam Engine.



Switchboard in the Gottfried Brewery Plant Recently Changed Over Into an Ice-Making Plant.

JULY ELECTRICAL EXPORTS SHOW MARKED FALLING OFF.

Decrease of Over $2,000,000 From the Record Total of June.

From the data just published by the Bureau of Foreign and Domestic Commerce, Washington, D. C., it is noted that the total of electrical exports from the United States during last July amounted to $3,827,345, as compared with $5,837,056 for June, which was the highest monthly total ever reached. In spite of this decided falling off, the figures for July show an increase of about 28 per cent compared with the total for July of last year. Moreover, the July total is very nearly up to the average of the 12 months constituting the fiscal year ended June 30.

Since July opens a new fiscal year in Government reports, changes in the classifications are made at this time. It is to be noted that the electrical exports are now still more classified than formerly through the addition of five new subclasses, as follows: Carbons, heating and cooking apparatus; magnetos, spark plugs, etc., rheostats and controllers; switches and accessories. The removal of these five classes from the miscellaneous, which is designated as "All Other," reduces the latter to approximately one-third of the total compared to about one-half of the total, as has been the case for quite a long time.

The detailed comparative figures for last July and for the corresponding month a year ago are given in the following table:

	July, 1917.	July, 1916.
Batteries	$ 290,312	$ 149,512
Carbons	102,828	.....
Dynamos or generators	96,057	131,597
Fans	41,245	28,395
Heating and cooking apparatus	23,295	.....
Insulated wire and cables	357,953	370,378
Interior wiring supplies, including fixtures	119,994	82,952
Lamps—		
Arc	1,962	803
Carbon-filament	23,349	3,738
Metal-filament	198,630	165,132
Magnetos, spark plugs, etc	269,941	.....
Meters and measuring instruments	68,630	46,486
Motors	411,687	411,474
Rheostats and controllers	14,201	.....
Switches and accessories	177,052	.....
Telegraph apparatus, including wireless	14,100	23,839
Telephones	180,937	74,162
Transformers	112,022	62,699
All other	1,323,150	1,444,690
Total	$3,827,345	$2,995,857

Improving Electric-Vehicle Performance During Winter

Use of Anti-Skid Devices May Save Delays—Inherent Cold-Weather Reduction of Battery Capacity May Readily Be Largely Overcome

By KENNEDY RUTHERFORD

THROUGH many adverse conditions and numerous objections that have to some extent been overcome, the electric vehicle for both pleasure and commercial applications has come to stay. The central-station companies and their affiliated societies are largely to be credited for the rapid growth of these vehicles within the last few years, and in applying them to many applications now known to be extremely suitable that once were thought far beyond their sphere of performance.

The high initial cost of the electric vehicle, as compared with the gasoline vehicle, and public bias have been factors to be overcome. The dependence of the vehicle for performance upon the capacity of a storage battery, the scarcity of charging stations, and delays and cost incident to a discharged battery have also contributed in hindering the use of the electric vehicle upon a wider scale. However, the increasing number of electrics in use has enabled these difficulties to be largely overcome by the springing up of charging stations and a practical battery exchange system, while the high initial cost, in Chicago at least, has been removed as a barrier to their use by the co-operative system inaugurated this year by the local central-station company.

The large central-station companies have long appreciated the latent possibilities of the electric vehicle as a load builder, that is at once a revenue producer and a means of bringing in a part of the overhead charges upon the generating and distributing systems, since the load is one that comes on chiefly during the night. The result is that the central-station companies have made strenuous effort in the development of the electric vehicle, with what success is now beginning to make itself apparent.

But while the manufacturer of vehicles and the company that hopes to supply them with energy can and have accomplished wonders in bringing the electric vehicle to the high state of efficiency and adaptability it has attained today, the individual owner can himself do much in bettering the performance of his vehicles. There are a few matters that have come to the writer's notice through experience, often exasperating and sometimes almost disheartening, that to his knowledge have not as yet been covered in the technical press. Some of them hold promise of great returns in the way of better performance, and for this reason the writer wishes to give them publicity for the general good.

Influence of Weather Upon Electric-Vehicle Performance.

The performance of any mechanically propelled vehicle tends to become less satisfactory in winter than in summer. In the fall the roads become wet and slippery, ruts and mud holes form which interfere with the movement over the road. In the winter the earth freezes, perhaps snow falls to block the way, or the roadway becomes very slippery, decreasing maximum acceleration and tractive effort. Even where the roadway is smooth and frozen hard, thus being favorable for high speeds, the cold air decreases the efficiency of the vehicle by increasing journal friction. Both gasoline and electric vehicles suffer during the winter months because of the condition of the roads. Actually the gasoline vehicles suffer more than the electric, because the characteristics of the latter—high sustained gradually applied torque—are more favorable to it, but on the other hand in obtaining these characteristics the battery becomes discharged, thus necessitating the electric being hauled home or else creeping along like some wounded thing.

In the large cities that boast of good roads, while the main thoroughfares may be maintained in first-class condition, many of the outlying roads in the residential districts and off the main paths of travel become almost impassable after the fall and spring rains. It is along these roads that the large army of delivery trucks, coal and ice trucks make their daily tour. It is in these outlying territories that most of the difficulties occur due to mud holes and deep ruts, and it is likewise in these same that help is most difficult and expensive to obtain.

When an electric vehicle sinks into a deep hole several things may happen. In endeavoring to get out the smooth-tired wheels churn up the edge of the hole and the vehicle sinks in deeper. The high torque exerted by the motors also discharges the battery at a high rate, which reduces the capacity more rapidly than were the rate slower. The result may unfortunately be that the battery becomes discharged to such a low value that it is necessary to have the vehicle towed to a charging station. This costs money and interferes with the delivery schedule. But perhaps more important still, the sight of an electric being towed by another electric or a gasoline vehicle creates a very undesirable impression before the public and amongst prospective purchasers particularly.

The electric vehicle is better able to climb out of difficulties than is the gasoline vehicle. The former exerts torque gradually and powerfully yet smoothly, whereas the gasoline engine jerks the vehicle partly out of the hole, straining the clutch and gear mechanisms in doing so; possibly the engine stalls and the vehicle falls back into the hole. The only thing is that the battery of the electric, while doing its work, may do it at too great a sacrifice in that the battery discharges itself. Under all conditions the electric will better the performance of the gasoline vehicle in the way of higher torque, more smoothly applied and longer sustained, but it accomplishes it by sacrificing battery capacity. It is extremely important therefore to employ every available means at one's disposal for economizing battery effort, that is to say, to not discharge the battery recklessly.

By the use during the next five or six months of anti-

skid devices, of which there are numerous forms on the market, the electric vehicle can in the majority of cases keep itself out of trouble and economize its battery capacity. The smooth tires of the electric so efficient for every day running are not conducive to efficient climbing out of mud holes and ruts such as may at any time be encountered unexpectedly. Surely it would be the wise thing therefore for every owner of an electric to equip each vehicle with some device for negotiating bad roads and similar difficulties. These anti-skid devices should not be installed on the tires until they are needed. A length of thick rope or chain that may be easily and quickly applied to the rubber tire when the need arises will save many a delay and much useless battery discharge and many needless homecomings on the crawl.

Effect of Cold Upon Battery Performance.

Every driver of an electric vehicle is appreciative of the fact that for a given charge of the battery the traveling distance is less in winter than in summer, and the colder the day the greater the difference. The ampere-hours used per mile may be greater in winter than in summer because of the condition of the roadway. Even though the ampere-hour meter indicates that a considerable portion of the input remains undischarged the driver knows on a cold day he will only reach home at reduced speed, though his meter tells him his battery is not nearly discharged. The meter indicates the capacity remaining in the battery, but it is not available. In other words, the capacity of a battery is reduced at lower temperatures, and the greater the reduction in temperature the greater the reduction in battery capacity. It is not an irreparable loss however, since when the temperature rises, the capacity not available before again becomes available. This is one very real objection to the storage battery.

During cold weather the roads are usually bad, thus requiring increased ampere-hours from the battery per mile. The cold temperatures also increase the journal friction of the vehicle, again requiring greater energy consumption per mile. Added to these is the fact that the battery is unable to give up as much of its charge as it can at higher temperatures. It is the loss of battery capacity due to cold weather that is chiefly answerable for electrics having to be hauled to charging stations during the winter or else for their having to creep to their garages at a snail's pace.

Comparison of Lead and Edison Batteries.

The decrease of available capacity with decreasing temperatures is greater with the Edison battery than with the lead battery. In both cases the condition of the plates and electrolyte and rates of discharge affect the rate of decrease of capacity. In the case of the lead battery the decrease is gradual and rather steady from 60 degrees Fahrenheit down, being about 0.7 to 1.5 per cent loss of capacity for each degree drop in temperature of electrolyte. On the other hand, the Edison battery has what is called a critical temperature, which is around 40 degrees Fahrenheit; this means that while the capacity decrease is gradual between 60 and 40 degrees, after the latter temperature is reached the drop in capacity is rapid. This is a very real disadvantage of the Edison or nickel battery because, whereas with the lead cell the driver may notice that for a definite position of the controller he is traveling more slowly than normally, thus indicating probably that his battery is running down (voltmeter readings give the same information), with the Edison cells he may make the discovery when it is too late.

Usually a driver is too preoccupied with other matters to worry about the condition of his battery as indicated by volt-ampere readings, or speed. The use of an indicating thermometer mounted upon the dashboard would, however, show him when the cold air was likely to affect his battery, though here the chief difficulty and cause of uncertainty would be in obtaining a cell that was typical of all the cells.

Reducing Effect of Cold Upon Battery Capacity.

The large increase in number of electric vehicles in the larger cities, likewise their use in more numerous fields of endeavor, has enabled electric charging stations to grow up in greater numbers, thus at once removing one of the greatest deterrents to the more universal use of the electric vehicle, and electric commercial truck especially. The ability to charge a battery during the day, for example, during the noonday meal, by giving it a short-time boost charge at a high rate, increases the permissible mileage very materially and improves the condition of the battery. The boost charge will do much to remove the fear amongst drivers of a really cold day and a long route, for it not only charges the battery but also heats up the electrolyte, thus making available some of that capacity not otherwise get-at-able, as already pointed out.

But, although charging stations may be conveniently and judiciously scattered in numerous locations, ready to help out the frozen battery, the only true and proper solution to modify the present objectionable limitations imposed by low temperatures appears to be to make the battery immune from cold. Effort will be made to show the manner in which this may be largely accomplished.

As decreased capacity with decreasing temperature is characteristic of both lead and nickel batteries, and as at the present time there appears no likelihood of a new battery making its appearance that is otherwise affected, attention may be most usefully concentrated upon making the battery immune from cold by modifying conditions external to the battery rather than attempting to change the battery itself. There are two ways of doing this, either of which may be used singly or together. It is the writer's opinion that the day will come when the former of these will be used invariably, the wonder being that it has not been done universally before, for all types of batteries; and when the latter will be done in any case with Edison batteries during the winter months.

One way to prevent these troubles very largely is to install the battery in a box having characteristics somewhat those of a Thermos bottle. To the writer's knowledge all electric vehicles, except one which uses a wooden cover, use steel boxes or coverings to house the battery. Moreover, ample space is permitted under or above and at the sides of these cases for the free circulation of air; in fact, when the vehicles are moving at full speed the ventilation through many of these battery boxes may be likened to forced draft.

Circulation of air around a battery is very desirable while the battery is on charge because hydrogen gas is evolved, and this when mixed with air forms an explosive mixture when in the proportion of about 92 parts air to 8 parts hydrogen. But danger from this cause can be prevented by keeping the battery box open while the battery is on charge, and by keeping lighted matches and other open flames away from the batteries. Moreover it is a good practice to have the charging battery exposed, as this tends to prevent forgetting that it is on charge, thus reducing the possibility of damage by overcharge. In the summer and

where the air is dry circulation of air round a battery is not objectionable. However, sulphuric acid is hygroscopic, and thus where fumes from the electrolyte settle upon the woodwork of the vehicle and battery box, corrosion may soon work havoc with the interior of the battery box and adjacent parts if moisture from the air enters.

When cold weather comes the circulation of air through the battery box is extremely objectionable, especially when it circulates with appreciable velocity, coming in through vents and openings such as invariably exist. The cold air reduces the temperature of the battery whether it is working or not, although somewhat less when the battery is discharging, as heat is formed during the reaction. Vents and openings in battery boxes should therefore be closed, except perhaps one gas vent in a sheltered location out of direct force of the draft with the vehicle in motion, otherwise the cold incoming air will reduce the available capacity of the battery.

But this is not the only way in which the cold weather affects a battery. On discharge the battery evolves heat. Some of this is carried away through the vents in the battery box. Part is dissipated through the steel coverings of the battery box. It is a matter of wonderment to the writer that battery boxes are not all of them lined with some form of acid-resisting, heat-insulating, non-absorbtive material, with only one vent for the escape of gas. The heat given off by the battery would then remain to keep the internal temperature of the battery box around that required, namely, not below 60 degrees, thus making available the full capacity of the battery. Why not make every battery box an imitation Thermos bottle? Why not do something that can be done so easily, so quickly and so inexpensively, when the results are so far-reaching, in that they may prevent stalling, permit better time of travel during cold weather by making the battery less susceptible to cold, and save the electric ridicule from its rivals?

But why not go still further in climates where the temperature is really low, and more especially where Edison batteries are in use. Make the battery box somewhat like a Thermos bottle, and further install a small electric heater, of about 100 watts, energized from the battery and controlled for constant temperature between perhaps 70 and 45 degrees by means of a thermostat. An Edison battery has about 100 per cent capacity at 80 degrees; 98 at 45; and about 40 per cent at 35, hence if the heater is able to maintain internal temperatures above 45 degrees, a vehicle so equipped will be immune from the effects of cold.

The lead battery is more susceptible to cold than the Edison battery between 80 and 45 degrees Fahrenheit, although its capacity drops gradually instead of suddenly as does the Edison battery. For example, the lead battery has a capacity of say 105 per cent at 80 degrees, 100 at 70, 95 at 60, 88 at 50, and 80 at 40.

The use of high heat insulation has the advantage over the arrangement employing special heating elements in that it requires no energy from the battery except what otherwise would be wasted, namely, natural warmth. Further, the heating unit would receive its energy from the battery, thus reducing its capacity. However, if 40 per cent of the capacity of a battery may be made available for useful work for the expenditure of but a fraction of this amount, is it not well worth while, for what is the value of that capacity if unavailable?

It is a matter of surprise to the writer that the manufacturers of electric vehicles, and the central-station companies that have done such admirable, untiring and conscientious work in pushing the electric vehicle to the fore should allow the limitations imposed by cold weather upon the storage batteries to exist when they may be so readily overcome.

The manufacturers get together, the central-station companies get together and tell what they are doing in cutting costs and improving apparatus. Will not some of the electric vehicle users get into print, too, and tell of what they have done, what results obtained in the way of bettering performance, reducing maintenance costs and increasing the mileage per unit of cost? The user is, ultimately, the one who must be satisfied. Many users can help other users, likewise the manufacturers who learn only by the experience and co-operation of their customers. It behooves all of us to leave no stone unturned in the endeavor to make the electric as efficient, as reliable and widely applicable as possible. It is only through co-operation that this can be accomplished quickest and most efficiently.

Statement of Secretary McAdoo on Liberty Bond Taxation.

Secretary McAdoo authorizes the following statement in regard to taxation of all 4 per cent Liberty Loan Bonds:

"The 4 per cent Liberty Bonds are exempt from all state and local taxes, except estate or inheritance taxes.

"They are exempt from United States normal income taxes and from all other United States taxes except estate or inheritance taxes and except income surtaxes, excess profits and war-profits taxes.

"The interest on $5,000 principal amount of bonds and certificates owned by any individual, partnership, association or corporation is exempt from all United States taxes except estate or inheritance taxes.

"This is true though their total holdings exceed $5,000

"In case of holdings by trustees, each beneficiary is entitled to independent exemption of the interest of $5,000 principal amount held in trust for him, even though the trustee is identical, if the trusts be separate.

"In case of families, the wife and each child, if the actual owner, is entitled to independent exemption of the interest on $5,000 principal amount so owned.

"No ownership certificate or other so-called information at the source will be required under the war-revenue act in connection with the payment of the interest on those bonds, whatever the amount owned.

"Undistributed income invested in these bonds is not subject to the additional tax imposed by that act on undistributed income.

"The foregoing statements apply to the 4 per cent Liberty Bonds now offered for subscription and also to those issuable upon conversion of the 3½ per cent Liberty Bonds." The above serves to clear up some misconceptions concerning this matter.

Porcelain Electrical Supplies.—The value of porcelain electrical supplies marketed in the United States in 1916 was $7,034,420, an increase of $2,363,218 over 1915, according to the United States Geological Survey, Department of the Interior. These wares were reported from 10 states, of which Ohio was the leader, reporting wares to the value of $2,181,026. New Jersey was second, with $1,674,093, and New York, third, with $1,623,433. These three states reported 78 per cent of the value of the entire output.

Traveling Water Screens for Condenser Intakes of Power Stations

Importance of Removing Trash from Condenser Water—Advantages of Traveling Screens—Construction Features—Description of Typical Modern Traveling-Screen Installations

By HENRY J. EDSALL

CONDENSERS are employed for condensing steam by cooling it, after it has passed through an engine or turbine. The condensation causes the steam to change from a large volume in a gaseous state to a very small volume in a liquid state, so that a condition closely approaching a vacuum is obtained and the back pressure on the pistons or turbine blades reduced to a low point. This is the same as adding pressure to the pushing side of the pistons, thereby increasing the power, and this increase of power is obtained without using more steam except for the operation of the condenser pump.

The type of condenser most commonly used in large plants is called a surface condenser and consists essentially of a large number of small tubes fitted into head plates at each end and inclosed in a cylindrical shell. The steam is piped into the condenser and comes into contact with the cool outside surface of the tubes so that it is instantly condensed. The cooling of the tubes is accomplished by pumping water through them and a large amount of water is necessary to take away the heat which the tubes receive from the steam, and to keep them cool enough for efficient condensing action.

Condensers Require Abundance of Water Free from Trash.

In order, therefore, to obtain an ample supply of condensing water, the large modern power houses are usually built close to a river, bay or lake and the largest of the electric plants are usually in a city, or near one, so that the water supply is apt to be foul and to contain considerable trash of various kinds at all seasons of the year and to contain a still greater amount during freshets and at certain seasons, as in fall when leaves are dropping from the trees.

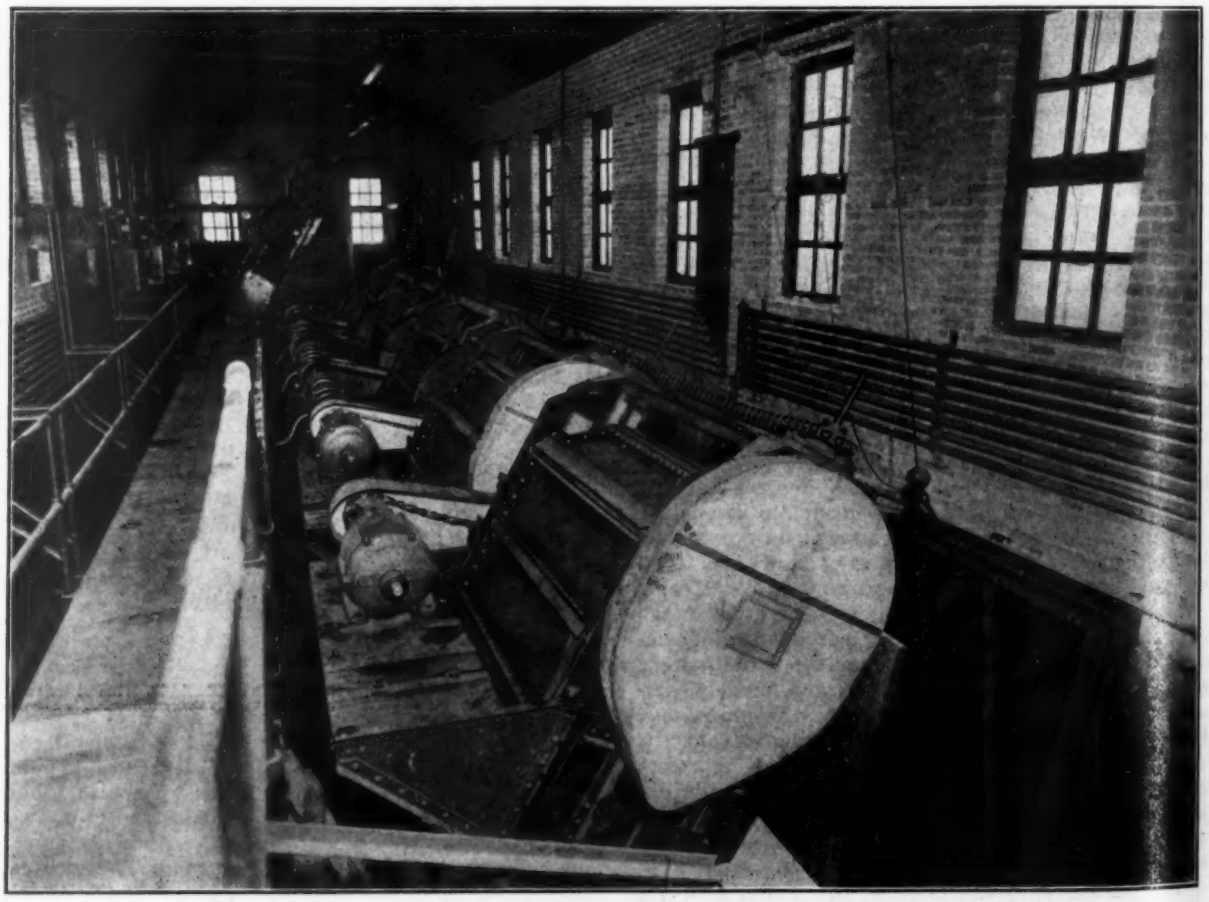


Fig. 1.—Water Intake Screens at Northwest Station, Commonwealth Edison Company, Chicago.

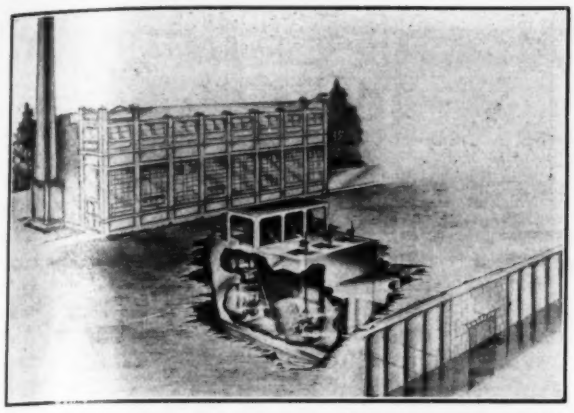


Fig. 2.—General View of a Traveling Water-Screen Installation, Showing Typical Arrangement.

It will be readily appreciated that if the trash in the water is allowed to get into the pumps and condensers, trouble of various kinds will result and the small tubes of the condensers, ordinarily only 1 inch in diameter, will become stopped up and, by having part of the tubes out of service, the efficiency of the condenser and the resultant saving in fuel will be correspondingly reduced. Even a leaf or a small piece of paper plastered across the end of a condenser tube will effectively stop it up. Fish frequently cause trouble also when not properly removed from the water.

The stopping up of condenser tubes not only reduces the efficiency but also increases the pressure on the head plates and sometimes a cracked plate is the result. In any case, if much trash is allowed to remain in the water, frequent cleaning of the condensers is necessary, which means that the condenser equipment must be large enough to allow for one or more units being out of service part of the time and that the laborious operation of opening up the condensers and cleaning them must be performed quite frequently. In some cases expensive by-pass piping has been installed so that a condenser could be easily cut out for cleaning purposes, whereas such equipment is not considered necessary where the trash has been effectively removed from the water.

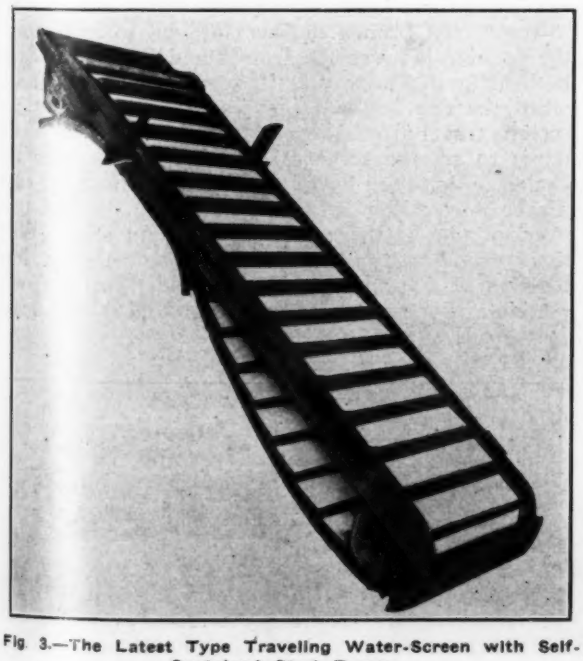


Fig. 3.—The Latest Type Traveling Water-Screen with Self-Contained Steel Frame.

Disadvantages From Use of Stationary Screens Alone.

In the past it has been the custom to place fixed screens somewhere in the condenser intake to keep out the fish and trash. Slots in the walls, or guides attached to the walls, were provided for the screens to slide up and down in, and two screens were placed in each intake so that one screen could be left in position while the other was raised for cleaning. As a matter of fact, the screens were not usually made with as small openings as is really required for effective screening, because the small openings became clogged up so soon and prevented the free flow of water unless cleaned very frequently. The larger screen openings resulted in the necessity of more frequent cleaning of the condensers than should have been required, so that it was really a case of a choice of evils, i. e., either having small openings in the screens and having them stopped up very quickly or else having larger openings and having to clean the condensers more frequently.

The amount of labor required for cleaning the fixed screens and the condensers and the loss of efficiency resulting if these operations were neglected led engineers to look around for a more efficient method of accomplishing the desired results. Various methods were tried out and it was soon evident that it was not feasible to leave the screens stationary and try to clean them mechanically, since often trash clings too closely and even sticks through the holes in the screens, so that it is practically impossible to scrape it or brush it off.

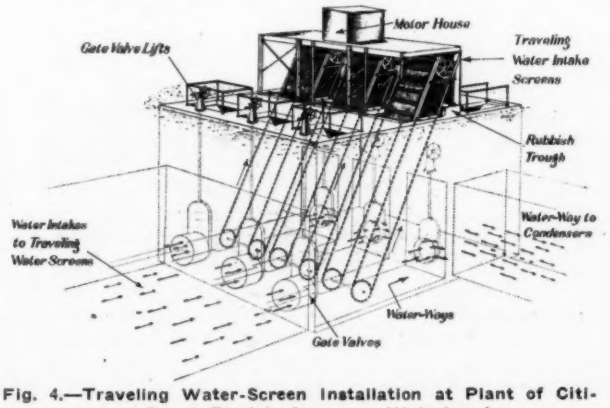


Fig. 4.—Traveling Water-Screen Installation at Plant of Citizens' Gas & Electric Company, Waterloo, Ia.

Principle of Operation of Traveling Screens.

The method finally adopted, and which is fast becoming standard practice, is to make the screens travel and carry the trash up to a level where it can be conveniently cleaned off and disposed of and also to provide shelves or buckets to carry up the larger trash which does not cling closely to the screens. As it was not found to be feasible to bend the screen wire around moderate sized drums, the screens were broken up into small sections, these sections being attached to steel frames and the frames attached to two strands of long-pitch chain traveling up and down and passing around sprocket wheels at head and foot. Shelves are provided on each screen frame for carrying up the larger trash and discharging it, as the frames pass

around the headwheels and start to descend, into a trough or other receptacle from which it can be washed away or disposed of as desired.

In order to remove the trash which clings to the screens, perforated spray pipes are placed just back of the upper part of the descending run and sprays of water at considerable pressure are forced against the screens from the rear so that practically all the trash is washed off. What little trash still remains, possibly sticking through the openings, can be easily removed by hand. In order to get the trash trough well in under the discharge point, the earlier screens were set at an incline, but in the latest design the ascending run is usually made vertical, large headwheels are used and the chains and screen frames bent back around guides just after they start to descend so that they are brought closer together, thereby making it possible to get the trash trough well in under the frames, just after they start to descend.

Details of Construction.

The chains to which the screens frames are attached are of the long-pitch steel-strap type with pins and rollers at the joints. The rollers serve to engage with the sprocket wheels at head and foot and to

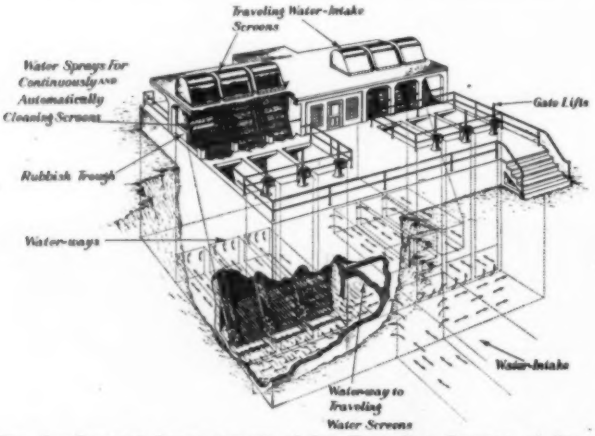


Fig. 5.—General Arrangement of Six Traveling Screens at Stations A-1 and A-2, Philadelphia Electric Company.

reduce the friction as the chains travel up and down in the guides or around the curved guides, where these are used on the descending run. The pitch of the chains, or length from center to center of joints, is usually 12 or 18 inches, more frequently the latter. This pitch determines the width of the frame since there is one frame for each pitch. The length of the frames is limited only by the necessity of strength and stiffness and depends on the design and weight of metal used. In most of the earlier screens the frames were not over 6 feet long, but this length is being exceeded by some of the screens now under construction and there does not seem to be any reason why the frames should not be made 10 feet long, or possibly more, if properly constructed.

In some cases the frames have been made of steel flats instead of steel angles, but the angles give a stiffer frame that is very hard to distort and if they are cut accurately to length with beveled ends and then welded together, they make a very neat, strong and true frame that will not easily get out of shape.

The wire cloth can be of copper, brass, steel or soft iron, the steel or iron sometimes being galvanized. The copper and brass are of course much more expensive than iron wire and it is doubtful whether this

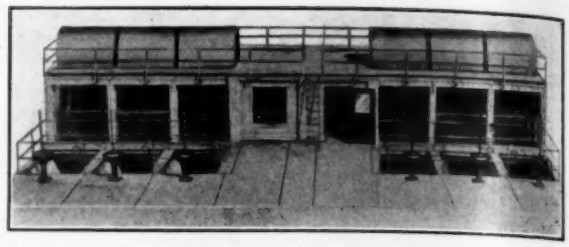


Fig. 6.—Front View of Screen House at Philadelphia Electric Company's Plant.

additional expense is justified, especially in fresh water. With the present prices of brass and copper it would certainly seem better to use iron, even if it was found advisable later on to replace it with copper or brass when renewals become necessary, at which time the copper and brass wire are likely to be less expensive than at the present time. Soft iron wire with less impurities than ordinary steel and similar to the much advertised ingot iron, which is claimed to resist corrosion much better than steel, would seem to be the best investment. The size of wire most used is No. 10 Birmingham gauge and the mesh or center to center distance of the wires is usually 5/8 or 1/2-inch, which, since the No. 10 wire is a little over 1/8 inch in diameter, leaves an opening between the wires of 1/2 or 3/8 inch. Sometimes smaller openings are used and the wires are also made smaller in some cases, especially when the material is copper or brass.

The usual method of attaching the screen cloth to the frames is to cut it so that it will fit down on the inside legs of the angles and clamp it with flats bolted to the legs. The frames are bolted to the chains with bolts that have countersunk heads on the inside of the links so that there will be no protruding bolt heads to interfere with the teeth of the sprocket wheels. If the frames are simply set on the chains so that they come up close together, they must be very accurately constructed and accurately attached to the chains or more or less opening is left between the frames where the trash can get through. When this method of attaching the frames to the chains is employed, there is usually an additional plate attached to the screen frames and bent around so as to cover the opening between the frames and this plate has to be bent in such a way as to keep the opening closed when the gap between the frames opens up as the screens travel around the footwheels. A better method is to set the screens at a slight angle with the chains so that the edge of one frame overlaps the edge of the next adjoining frame and have this point of overlap come at the center of the chain joint. With this method the screen frames can be set very close together so that any gap will be avoided and they will not bind or open up as they pass around the head and footwheels.

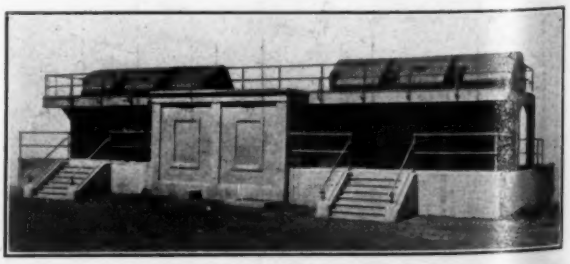


Fig. 7.—Rear View of Screen House of Philadelphia Electric Company, Philadelphia, Pa.

In order to avoid having the trash get past by going through the links of the chain, these chains, on the ascending side at least, are made to travel up and down in guides and the links of the chain and the spaces in the guides are designed so that the links fit quite closely in the guides and thereby do not leave any passageway for the trash to get through. As the frames pass around the footwheel, since the trash shelves extend a few inches beyond the screens, sufficient clearance has to be allowed underneath the footwheel for these shelves to pass the bottom of the screen chamber. When one shelf is directly underneath the center of the footwheels it comes close to the bottom, but as soon as it gets a little ways off center it leaves a space underneath between the shelf and the bottom of the screen chamber so that trash can get past. In order to avoid this gap at the foot a curved plate should be used so that one of the shelves will always be close to this bottom plate and thus close up the gap. This plate is best attached to heavy side castings, which in turn are attached to the lower end of the frames and can also be used to support the footshaft bearings.

The frames are usually made self-contained so that a complete screen can be lifted out bodily, if desired. These frames should be made heavy enough to allow for more or less corrosion and the fewer members there are to corrode and the stiffer the frame is made the better, providing it is not too heavy. These frames have guides on each side, like the tongues of tongue-and-groove boards, and these guides slide up and down in slots built into the concrete walls or made of cast iron or other material and attached to the face of the concrete walls of the screen chambers. These guides can be of cast iron, steel or even simple wooden timbers bolted to the screen frames.

One or more screens can be driven by a single electric motor, and as the speed of travel of the screens is very slow, usually about 9 feet per minute, it is necessary to gear down from the speed of the motor to a speed of about one revolution per minute for the headshaft of the screen. The simplest and most effective method of doing this is to use a differential

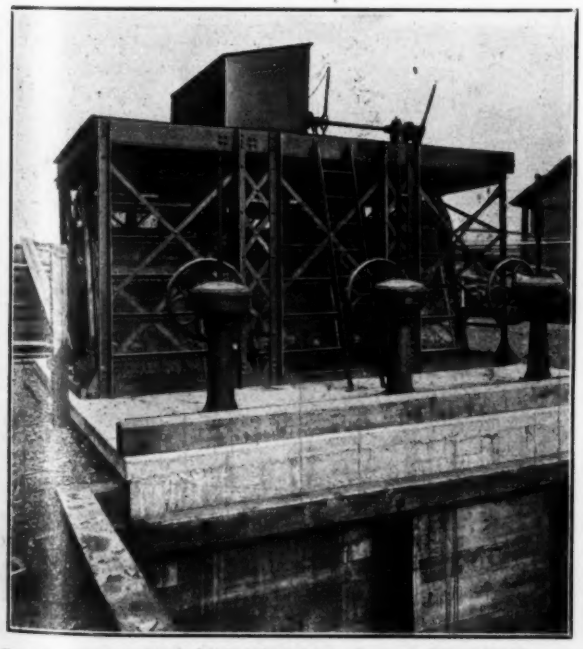


Fig. 8.—Three Traveling Water-Screens at Plant of Beacon Light Company, Chester, Pa.

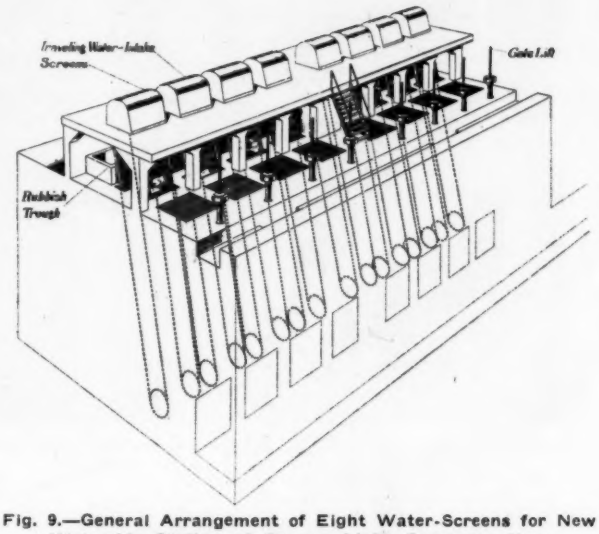


Fig. 9.—General Arrangement of Eight Water-Screens for New Waterside Station of Beacon Light Company, Now Under Construction at Chester, Pa.

speed-reducing device, employing either silent chain and wheels or spur gears. Very little power is required for the operation of the screens on account of the slow speed, and because it is only necessary to overcome friction, which is kept quite low by the large rollers in the chains. In operating the screens, they are, as a rule, run only at intervals and only long enough each time to get them properly cleaned off. The frequency of operation necessary depends upon the condition of the water.

Where there is more than one traveling screen, each screen is usually placed in a separate compartment, with valves for shutting off the flow of water where it comes into the compartment and also where it goes out, so that it is possible to shut this compartment off completely and pump the water out in case repairs to the screen are necessary. As previously stated the screens are, as a rule, built with a self-contained frame so that they can be lifted out bodily if desired. Either method can be used for getting at the screens for making repairs and if a spare screen is kept on hand it can be used to replace the one on which repairs are being made while this is out of service. Since, however, the screens are so simple and the work so light, repairs are few and far between and it is not, as a rule, considered necessary to keep a spare screen on hand, but simply use a fixed screen in case it is necessary to raise one of the traveling screens. Or, if sufficient water can be obtained temporarily without the use of one screen, the one compartment can be left cut off while repairs are being made.

Typical Traveling-Screen Installations.

Of the accompanying illustrations, Fig. 1 shows the screen installation at Northwest Station of the Commonwealth Edison Company, Chicago. The two screens seen in the foreground are Link-Belt traveling screens recently installed. Fig. 2 gives a good idea of the general arrangement of a traveling-screen installation. The latest type of these screens is shown in Fig. 3.

Fig. 4 is an illustration of a typical screen installation of modern size, which is now under construction for the Citizens' Gas & Electric Company, Waterloo, Iowa. In this case the forebay is divided up into three compartments, for three screens, and the valves

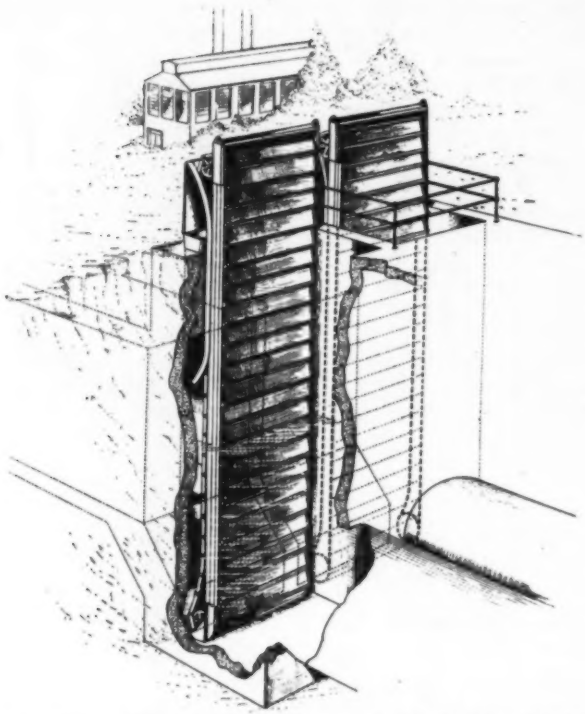


Fig. 10.—Two Traveling Water-Screens Under Construction for Consolidated Gas, Electric Light & Power Company for Westport Station, Baltimore, Md.

at the inlet and outlet of each compartment are clearly shown. The screen frames are built of 2½ by 2 by ¼ inch angles, and they are 4 feet 1 inch long by 16¾ inches wide. The chains are 18-inch pitch, with a 3¼-inch roller at each joint, running on the outside of a bushing secured to the inside links, and there are 1-inch rods which run all the way through and which are journaled where they go through the chains. The outside ends are milled off flat, and fit snuggly into corresponding holes in the outside links, so that the rods turn with the links instead of having the links turn on the rod. This arrangement of rods turning in bushings gives a large bearing surface in the joints and prevents wear on the links and the rods help to tie the strands of the chain together securely.

The wire screens are bent up on the edges and clamped to the inside of the angle frames by means of steel flats and bolts. The bolts for the sides of the frames and for the ends where attached to the links have countersunk heads. The flats on the lower side of the screen frames extend out beyond the angles and are bent up to form buckets to carry up the trash, and there is also an additional plate riveted underneath which extends across the gap between the frames, and closes this up so that trash cannot get through between.

Each screen unit is 30 feet center to center of head and footwheels, and the sprockets are 36 inches pitch diameter. Each screen is geared with spur gears to a countershaft, which in turn is driven from a jackshaft by means of a chain and sprocket-wheel drive, with jaw clutches for throwing the drive in or out; and the jackshaft is connected to a motor by means of a speed-reducing device. The jackshaft runs at a speed of about 23½ revolutions per minute, the headshaft at a speed of one revolution per minute, and this means a little over 9 feet per minute travel for the screens.

Figs. 5, 6 and 7 show a traveling water-screen installation for the principal power station of the Philadelphia Electric Company, in Philadelphia, Pa., this station being subdivided into two, known as stations A-1 and A-2. In this case there are six screens, each having an effective width of screening surface of about 5 feet, so that the total width of screening surface of the six screens is about 30 feet. The condensers at this plant require about 411,000,840 gallons of water in 24 hours when running under full load.

The screen frames in this case are made of ⅜ by 2-inch steel flats, bent into rectangular form and welded together, and the wire screens are made of No. 10 Birmingham gauge galvanized wire, ½-inch mesh. These wire screens are bent up at the edges and attached to the frames by means of ½-inch bronze bolts, with steel washers under the nuts. The plates which are attached to the steel frames, to form the ledges for taking up the trash, are 3/16-inch steel plates 4 inches wide. The chains are of 18-inch pitch steel-strap links, with ¾-inch cold-rolled steel pins, and 4½-inch diameter cast-iron rollers with Tobin bronze bushings, these bushings revolving on the steel pins.

The sprocket wheels at the head and foot are 42½-inch diameter, seven-tooth wheels, all keyed to the shafts which run in babbitted bearings, no provision being made for oiling the foot bearings under water, as this does not seem to be necessary. The shafts are made of nickel steel in order to avoid corrosion as far as possible. Each headshaft is driven by means of a chain and wheel drive from a countershaft and the countershaft is connected through a reducing gear to a five-horsepower motor. The spray pump for delivering the spray for cleaning the screens is located in the concrete house between the two sets of three screens each, and this pump has a capacity of 500 gallons per minute. It operates the spraying nozzles on three screens at a time.

Fig. 8 shows an installation of three traveling screens for the Beacon Light Company, at Chester, Pa. The valve-operating wheels are clearly shown in front of the screens, and the house for the motor, which operates the three screens, is shown on the top of the framework. The general construction of the

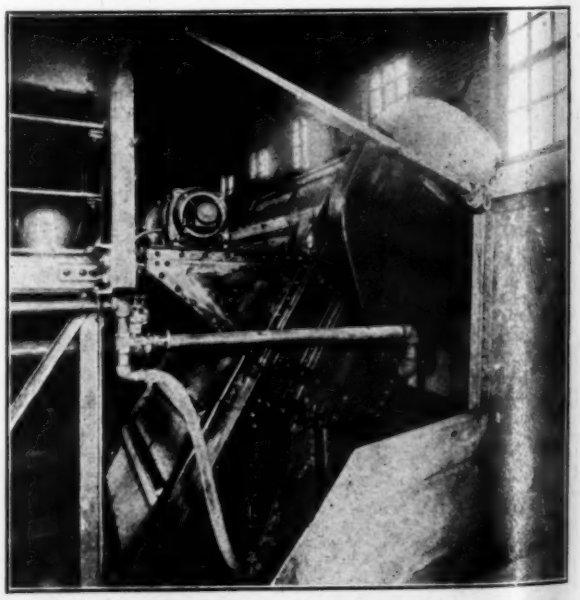


Fig. 11.—Another View of the Latest Traveling Screens in Northwest Station, Commonwealth Edison Company, Chicago. Compare with Fig. 1.

screens is very similar to the ones described above, but the screen cloth used in this case is made with copper wire.

In Figs. 9 and 10 are shown two of the latest designs for water screens, neither of these equipments being yet in operation. Fig. 9 shows the eight screens which are to be installed at the Chester Waterside Station of the Beacon Light Company, at Chester, Pa. These screens will each be 39-inch centers and the frames will be 5 feet 4½ inches wide. They are to be set at an incline of about 20 degrees from the vertical and each screen is to be operated with a separate motor and have a separate screen chamber with valves for shutting off each chamber. The screen wire is to be No. 10 gauge, soft iron wire ⅜-inch openings.

Three new screens of the latest type are being built for the 201st Street Station of the United Electric Light & Power Company, New York City. These screens are to be 32 feet 6 inches centers with screen frames 5 feet 5 inches long. The chains are 18-inch pitch and the frames are of angle iron with No. 10 gauge soft iron wire for the screen cloth with ⅜-inch openings. The screens are to be vertical with heavy self-contained frames of channel and angle members with flats for diagonal bracing and with cast-iron guides which will slide up and down in cast-iron slots set into the walls of the screen chambers. These screens will be driven from a single 10-horsepower motor connected through a speed-reducing device to a common countershaft and connection from the countershaft to each screen being by means of chain drives with clutches for throwing away screen in or out. The screen frames are of the overlapping type, and the complete screen frames and wire cloth will be galvanized.

Fig. 10 shows two new water screens for the Westport Station of the Consolidated Gas, Electric Light & Power Company, Baltimore, Md. These screens will be 32 feet centers with screen panels 8 feet 11 inches wide and the wire cloth is to have ¼-inch openings instead of ⅜-inch. Aside from these differences these screens are of the same general design as the New York screens. Both these installations are therefore of the latest and most improved design, which has been developed from a great deal of experience in building water screens.

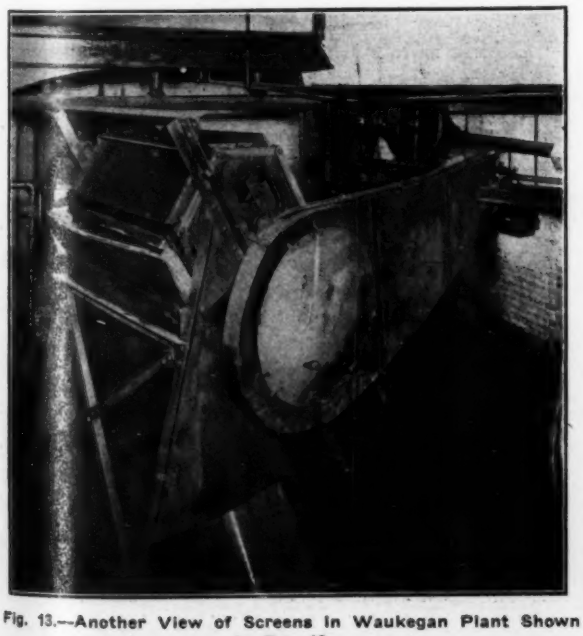


Fig. 13.—Another View of Screens in Waukegan Plant Shown in Fig. 12.

Fig. 12.—Traveling Water-Intake Screens of Public Service Company of Northern Illinois, Waukegan, Ill.

An older installation of Link-Belt traveling screens is shown in Figs. 12 and 13. These are in the Waukegan (Ill.) station of the Public Service Company of Northern Illinois. They were installed in 1905 and are still in successful daily service.

A NORTHERN CALIFORNIA HYDROELECTRIC POWER PLANT.

Southern Pacific Company May Use Energy for Trains Over Siskiyou Mountains.

The California-Oregon Power Company has about completed a hydroelectric power plant at Copco, on Klamath River, in the extreme northern part of California. The construction work has been going on three years, and the plant is expected to be ready for operating with an initial capacity of 25,000 horsepower by December 1. The site of this development is 14 miles easterly from Thrall, a station on the main line of the Southern Pacific Railway. A local railroad, connecting those two points, has been in service during part of the time this plant construction has been in progress. A reinforced concrete dam was built across the stream, forming above it a lake of several thousand acres in area. The turbines, generators and other equipment required in the construction of a modern plant are being installed. The plans and construction were carried through under direction of P. O. Crawford, engineer in charge, assisted by J. C. Boyne. The dam was designed by Herman Schussler. It is understood this plant was planned and built to supply the Southern Pacific Company with electric power for operating its trains over the mountain division of northern California and southern Oregon, which includes the circuitous route across the Siskiyou Mountains.

City's Electricians Appeal to Council for Wage Increase.

An ordinance before the City Council of Louisville, Ky., provides for an increase in the wages of the city's electricians from $2.75 to $3.60 a day. These men went on strike early in October but later returned to work when they were informed that their cases would be referred to the City Council.

Editorial Comment

War Gains Should Be "Consolidated" For Peace Conditions

ONE of the chief factors in the success of the co-operation between American electrical interests and the Government in pushing war preparations is the readiness of the latter to employ business experts of the highest ability in the auxiliary organizations that have been developed to deal with important problems. These organizations are becoming so perfected and harmonized that they ought in some way to be perpetuated to take care of the more important affairs of peace.

Doubtless this desirable result could be achieved now without serious interference from persons raising the two stock objections heretofore offered to having the government "meddle in business"—the assertion that it is constitutionally inefficient and the outcry against alleged "paternalism" or socialism. To those who still fear these bugaboos it might be pointed out that for many years the government has been "meddling" with the vast and complex business of agriculture, to the growing satisfaction of the farmers.

The National Government could easily make use of the same sort of experts in manufacture and merchandising, even in the labor field, and with them it could perform invaluable service to commercial interests without becoming "paternalistic." Undoubtedly it would do well to utilize the great talents of its present incomparable staff of business men in building up permanent organizations of that kind, thus "consolidating" war advances for the more important work of peace.

Some exceedingly important as well as interesting developments in our business methods are also resulting from the Government's control of the banks with which, in this rapidly expanding field, electrical men and others must do business. While some of these are not the results of American inventive genius, they are being adopted here, after having been tried out and proven satisfactory in the older European countries.

The open book credit and cash-discount method of doing business in this country has been so firmly established, that at the time the provision for trade acceptances was included in the Federal Reserve Act, many were of the belief that it would require years before any radical change could be brought about in the methods of handling credits in this country. It is remarkable, therefore, to what extent trade acceptances have already come into use during the war period.

Conditions in the money market and the tremendous requirements of the Government have brought about a shortage of liquid commercial funds, and this is forcing a change in the old unscientific method of handling credits. It is essential during the war that the bank resources of the country be kept as liquid as possible, and, as recently pointed out by the ELECTRICAL REVIEW, greater opportunity for doing so is offered under the new system.

Reasonableness of Electric Railway Rate Increase

IN no branch of electric utility service has the margin for reasonable profit been so close as with electric urban and interurban railways. Serious mistakes of policy on the part of both railway managements and public authorities have resulted in demanding from electric railways a service whose cost has steadily increased and whose rates per mile have gradually decreased. The present period of extra high costs has therefore practically wiped out what little profit there was for the investors in these utilities and compelled them to seek rate increases or service concessions to avoid bankruptcy. The electric railways of New York State are making a united effort to seek relief from these threatening conditions. The press is frequently a barometer of the consensus of public opinion respecting such matters, and it is pleasing to note, therefore, the fair and reasonable treatment of this subject by the New York Commercial, which in a recent issue says:

Electric railways have come into being within the last thirty years, and it has taken that length of time to arrive at their costs of construction, maintenance and operation. In our cities they supplanted horse cars and cable lines and adopted the old five-cent fare while extending the old zones of operation to an extent that has made many of the systems unprofitable. On interurban lines competing with steam railroads the fares were cut to get traffic without counting the costs of operation and maintenance.

Promoters were interested in construction profits and were backed by manufacturers of rails, cars and electrical plants, and investors did not take into account the cost of replacements and improvements. Now that wages, coal, equipment and other supplies have advanced in cost to a degree never anticipated by the most cautious, many companies are in evil plight and are seeking relief from state legislatures, municipal councils and public service commissions.

Traction companies in New York City and up-state

are asking for higher rates or for leave to charge for transfers. Those who oppose the granting of such relief speak of these applications as attempts to get something for which companies in other parts of the country do not ask. This is untrue. The statement of M. C. Brush, president of the Boston Elevated Railway Company, before the Street Railway Investigation Commission of the Massachusetts Legislature shows that these conditions prevail in New England and elsewhere in this country.

Investors will not supply capital for public utilities unless there is some surplus above fair dividend requirements to serve as a guarantee of the continuance of the dividends. Without capital the companies cannot improve and extend their service. The public demands good service and is benefitted by the improved credit of the company. If fares are not remunerative the service suffers. In 1890 this country contained only 1250 miles of electric railway track while today there are more than 40,000 miles. Investors have already lost so much in income and in the market value of their investments, as Mr. Brush points out, that they are reluctant to invest money under the present system.

Public service commissions have found it easy to make rates reasonable when they were too high, but when rates were unreasonably low and did not give the public the services it required they seem to have encountered a problem that they are apparently unable to handle.

It is evident that there must be some limit to the distance a passenger can be carried without loss. By using transfers and sometimes on straight runs passengers often travel twenty miles or more for five cents, which is preposterous. Straight runs on a few lines in Greater New York exceed fifteen miles and many of them exceed ten miles. When the excessive costs of equipment, maintenance and operation in large cities are taken into account there is not much difference between the city and the interurban lines in the expense of carrying a passenger one mile.

The city lines carry more people but their installation is more expensive and more costly to maintain. These costs should be ascertained and a limit should be put on the distance a passenger can travel for five cents in justice to the company. We hear of cheap fares in Glasgow, Scotland, but the zone system prevails there and long-haul passengers pay far more than they do in America. We will not get anywhere by refusing to consider the claims of the public utility companies which serve us.

Review of the Copper Situation

THE copper market, during the last two months, has continued to reflect the condition of uncertainty that has prevailed, and which still exists. The agreement entered into between the War Industries Board and the principal copper producers became effective September 20. Under this agreement the price of copper was fixed at 23½ cents per pound, f. o. b. New York, which price was to be subject to revision at the end of four months. For several weeks previous to that date, the market was inactive because of uncertainty as to the price the Government would pay, and it was believed its decision would stabilize market conditions. Since that agreement went into effect, the atmosphere has not cleared, nor has the uncertainty been dispelled. There have been absolutely no transactions in copper at 23½ cents except between the copper producers and the Government. Copper consumers are receiving some supplies of the metal at the higher prices agreed on under previously-made contracts; and the Government's four-months decree of 23½-cent copper places no restrictions on producers as to contracts for delivery after January 20 at 26 cents. It is reported that this is the quotation made for such deliveries. No supply is offered manufacturers for spot delivery at 23½ cents because, it is asserted, orders from the Government require all available supplies.

The effectiveness of the Government's price-fixing has been nullified so far as domestic consumers are concerned; and if the Government price of 23½ cents shall be renewed on January 20, the consumers, who are now contracting with producers for copper at 26 cents, for delivery after that date, will continue to receive no benefit from the Government price. The only copper offered consumers for immediate delivery are small lots in the hands of dealers whose price is 27 to 28 cents. Apparently, under the terms of regulations established, dealers have no right to sell at a price higher than 23½ cents. If this regulation were enforced, the dealer would be eliminated, because there has been and probably will be no opportunity for him to buy at a price below that figure. It is probable that the conferences between the producers' committee and the consumers' committee may result in regulations of a more workable nature, especially as to distribution.

Comments on the situation of an illuminating character are published by the Habirshaw Electric Cable Company. Concerning the agreement between the War Industries Board and the copper producers, this authority says:

> An important feature of the agreement is that which provides that wages will not be reduced. The avowed purpose of this is to prevent strikes and maintain maximum production. It is a wise provision if it accomplishes its purpose, but will it? Past experience has shown that the raising of wages in the copper districts has led to new demands enforced by strikes. This means that the cost of production is steadily increasing and that maximum output is impossible. Every one recognizes the fact that war has placed a heavy burden on productive labor, and wishes to see it well paid, and, if possible, satisfied. In stipulating that wages shall not be reduced the Government has probably done all it can to accomplish this end, but we doubt that it will go very far in preventing strikes. To our mind the most effective action of the Government in maintaining peace in our mining districts is the rounding up of paid German agitators who were the chief fomenters of trouble.

What concerns domestic consumers most at present is the matter of securing copper, rather than the question of prices.

HAPPENINGS IN THE INDUSTRY

Jovians Hold Important Convention—Code Revision Not Radical—Electric Railways Need Higher Fares—America's Electrical Christmas—Progress in Incandescent Lighting

JOVIAN ORDER HOLDS IMPORTANT ANNUAL CONVENTION.

Many Changes in the Constitution Decided Upon at Meeting Held in New York City, October 22 and 23.

The adoption of numerous important changes in the present constitution, intended to strengthen the organization locally, was the chief feature of the annual convention of the Jovian Order held at the Hotel McAlpin, New York City, October 22 and 23. It was the consensus of opinion of those in attendance, as well as of the committee which suggested the changes after a comprehensive study, that Jovianism could be of the utmost value to the electrical industry only by much greater development and activity of the local Jovian leagues, the national order to perform its major development work through such established leagues. In order to secure a large number of new members in the shortest possible time it was agreed to suspend the initiation fee until next February and thereafter establish it at $5.

A suggested amendment providing for election of congressmen and statesmen by letter ballot was changed to election by ballot at the annual convention, the discussion on this amendment indicating that it was desirable to preserve the friendly rivalry that has been such an interesting feature of election contests at previous conventions. It was also voted to permit all of the nominations of candidates for all offices to be made up to within 24 hours of the time of election.

The principal changes decided on are as follows: More specific statement of the function of the Order, which is to guide and co-ordinate the activities of the local leagues and to perform the major development work through these established leagues; a member is to have the right to choose the league with which he shall be affiliated, regardless of whether he resides in the district assigned to such league; hereafter Jupiter and Mercury shall be nominated by a nominating committee composed of Jupiter, the three preceding Jupiters and three congressmen; the tenure of office hereafter is to correspond to the calendar year; the congress of the Order shall meet at each annual and special convention, regardless of other meetings it may hold, and it shall act as an advisory board relating to the entire territory and membership of the Order; the division of the annual dues is to be equal between the national order and the local league; several changes providing for a reduction of the expense of conducting the central office were arranged for; compensation of Mercury will hereafter be fixed by the nominating committee.

The convention was opened on Monday afternoon by Jupiter Henry L. Doherty, who reserved his principal address until the concluding dinner on Tuesday evening. He stated that the question of holding the convention under present war conditions had been given very serious consideration and it was only because of the need for the numerous suggested constitutional changes that it was desirable to meet in regular annual convention. Mercury Ell C. Bennett presented his annual report, reviewing general conditions in the Order, and especially with respect to membership and finances. He stated that the war has, of course, had a very serious effect on the securing of new members as well as the collection of dues. Some of the suggested changes in the constitution were aimed to secure greater economy in the administration of Jovian affairs and to effect numerous savings which present conditions indicated. A letter was received from E. N. Hurley, chairman of the Shipping Board, congratulating the Order on the work it is doing for the electrical industry, a work which is not paralleled in any other industry.

On Tuesday morning the session was a patriotic one, the dominating feature being the address by J. W. Lieb, president of the National Electric Light Association and head of the National Committee on Gas and Electric Service. Mr. Lieb spoke of the assistance which this committee, representing these two very important public utilities, has been able to render to the various departments of the Government, particularly in supply service for construction and operation of the various cantonments and camps throughout the country. Much work has also been done by the committee in suggesting the men best qualified for special Government engineering services. Mr. Lieb concluded with a very stern appeal for support from the electrical industry of all war activities of the Government and particularly in liberal subscriptions to the new Liberty Loan.

L. T. Block, manager of the Utilities Indemnity Exchange, preceded Mr. Lieb and outlined the position of this organization in taking care of Jovian insurance.

The session on Tuesday afternoon was devoted largely to a detailed discussion of the constitutional changes, which were subsequently adopted. An important feature of this session was the adoption of a resolution pledging the support of the Order in men, work and money to the Government.

Election of Officers.

The election of officers for the ensuing year concluded the convention and, as there were no contests for any office, the ticket as proposed by the nominating committee was unanimously elected. The new officers are as follows:

Jupiter: J. F. Strickland, president of Texas Power & Light Company, Dallas, Tex.

Mercury: Ell C. Bennett, St. Louis, Mo.

Congressmen for Districts Nos. 1 to 13 inclusive: William R. Phipps, Brush Electric Company, Galveston, Tex.; Joseph Insull, General Electric Company, Pittsfield, Mass.; Harry W. Alexander, New York City; Arthur G. Pierce, Cutler-Hammer Manufacturing Company, Pittsburgh, Pa.; T. J. Craighead, Louis-

ville, Ky.; Julien Binford, Jr., Westinghouse Lamp Company, Atlanta, Ga.; W. R. Power, Huntington, W. Va.; Galen Crow, Public Service Company of Oklahoma, Guthrie, Okla.; L. O. Ripley, Kansas Gas & Electric Company, Wichita, Kans.; Henry N. Remington, Central Illinois Light Company, Peoria, Ill.; William T. Wallace, Idaho Power Company, Boise, Ida.; H. L. Woolfenden, Allis-Chalmers Manufacturing Company, Denver, Colo.; J. N. Colkitt, John A. Roebling's Sons Company of California, Los Angeles, Cal.

Statesmen: For Arkansas, C. J. Griffith, Little Rock Railway & Electric Company, Little Rock; Arizona, California and Nevada, Lewis E. Sperry, New York Insulated Wire Company, San Francisco; Idaho, Ernest C. Kiersted, Idaho Power Company, Twin Falls; Iowa, H. W. Garner, Des Moines Electric Company, Des Moines; Illinois, L. C. Spake, McGraw-Hill Publishing Company, Chicago; Indiana, Wallace O. Lee, Indianapolis Light, Heat & Power Company, Indianapolis; Kentucky, J. B. Riley, Westinghouse Lamp Company, Louisville; Louisiana, W. A. Porteous, Western Union Telegraph Company, New Orleans; Minnesota, North Dakota and South Dakota, W. H. Vilett, Sterling Electric Company, Minneapolis; Maryland, J. G. Livingston, Southern Electric Company, Baltimore; Massachusetts, C. B. Burleigh, General Electric Company, Boston; Missouri, Fred Johnson, Wagner Electric Manufacturing Company, St. Louis; New Jersey and Delaware, H. C. Sterling, Atlantic City Electric Company, Atlantic City; New Mexico, J. A. Shepard, Deming Ice & Electric Company, Deming; New York, E. G. Hines, Electrical World, New York City; Ohio, J. M. Bateman, Western Electric Company, Cleveland; Oklahoma, Charles McCallum, Western Electric Company, Oklahoma City; Oregon, A. S. Moody, Pacific States Electric Company, Portland; Rhode Island, E. R. Davenport, Narragansett Electric Light Company, Providence; South Carolina, W. W. Fuller, Isle of Palms Traction Company, Charleston; Tennessee, C. J. R. Watson, Jr., Electric Supply Company, Memphis; Texas, Hiram O. Clark, Houston Lighting & Power Company, Houston; Utah, Charles H. Talmage, Western Electric Company, Salt Lake City; Vermont, E. E. Larabee, Twin States Gas & Electric Company, Bennington; Virginia, Guy E. Siler, Virginia Railway & Power Company, Richmond; Wisconsin, Carl Golin, Northwestern Storage Battery Company, Milwaukee; Province of Alberta, Norman S. Richards, Northern Electric Company, Calgary; Province of Manitoba, J. H. Schumacher, Schumacher-Gray Company, Winnipeg; Province of Quebec, E. N. Hyde, Northern Electric & Manufacturing Company, Montreal.

The convention was marked by close attention to the business matters before the meeting and the sessions were well attended. In the way of entertainment features there was a luncheon given by the New York Jovian League to all visiting Jovians on Monday noon. A dinner on Tuesday evening closed the convention; the principal address at this was made by Jupiter Doherty.

NO RADICAL CHANGES IN NATIONAL ELECTRICAL CODE TO BE MADE.

Two-Day Meeting of Electrical Committee Passes on Proposed Changes Like Clockwork.

An important recommendation regarding the interpretation of Rule 68*d*, which prohibits approval of refillable fuses, was the most important feature of the open meeting in New York City on Tuesday and Wednesday this week of the Electrical Committee of the National Fire Protection Association, which considered the biennial revision of the National Electrical Code. The recommendation of the Electrical Committee on this matter, which was unanimously carried, was as follows:

"On the evidence presented to or obtained by the committee, it does not recommend any change in Rule 68*d*, but presents this report with the understanding that, in order to obtain additional field experience, municipal and underwriters' inspection departments may permit a continuation and extension of the use of such refillable fuses as have in their opinion been shown to comply with the tests specified for standard cartridge fuses and to be suitable for use."

Consideration of the Electrical Committee's recommendations continued through all the sessions with unusual rapidity. This committee had considered carefully the suggested changes in the Code and in almost nine cases out of ten had recommended that no action be taken. In fact, as Secretary Ralph Sweetland read off the proposed sectional changes and additions, together with the Electrical Committee's recommendations, the latter became so monotonously "Recommend no action be taken" that it aroused comment. The reason for this probably lay in the fact that there had been so much more time for consideration by the committee, owing to the postponement of the meeting from last March, that the suggestions had been scrutinized more carefully than usual, and less opportunity left for discussion by the open meeting as a whole. Almost without exception the recommendations of the committee were accepted by the meeting and passed without debate.

Tuesday forenoon, October 23, was occupied with the supplementary report of the Committee on Grounding, while in the afternoon, with quick, snappy work on the part of Chairman F. E. Cabot and Secretary Sweetland, most of the recommendations were passed upon up to the subject of fixture wiring, except the committee reports on fuses, switches and meter installations, thin-wall conduit and switches and cutouts, which were laid over until Wednesday. There were 131 present at this meeting.

Among the suggestions that the committee recommended be adopted, and which were passed without dissent at the meeting, were the three new sections *u*, *v* and *w*, relating to molding work, and which have previously been recorded in the ELECTRICAL REVIEW. The last sentence in section *u*, which had tended to make the rule not apply to concealed work in walls or ceilings composed of concrete, tile or other noncombustible materials, was stricken out, at the recommendation of the committee. Sections *e* and *f* under armored cable were also adopted relating to the entering of junction boxes and other outlets, providing for approved terminal fittings which will protect the insulation on the conductors from abrasion unless such protection is provided by the boxes or outlets themselves. All the recommendations under Rule 37*b*, relating to electrically operated organs were also adopted, as were some minor changes to sections *a* and *c* of garages.

On the whole, however, so little action was taken on all the scores of recommendations made in the past year, that it indicates that the Code is coming to be more and more a perfected basis for practical work, requiring little change aside from that demanded by progress of the art.

INCREASED INCOME ESSENTIAL TO ELECTRIC RAILWAYS.

Problems Facing These Utilities Outlined and Discussed by Joseph K. Choate.

In an address before the American Electric Railway Association, at a meeting in New York City, October 9, Joseph K. Choate, chairman of the Committee on Ways and Means to Obtain Additional Revenue for Electric Railways of New York State, presented an array of facts of paramount interest to these utilities at this time. His address, in part, is reproduced as follows:

The prosperity of the electric railway is a matter of selfish interest to every individual in the community. City life, as we know it, is impossible without the electric railway. Without it, workers could not live in the healthful outskirts of the city, traveling comfortably, quickly and cheaply between their homes and their places of employment. The electric railway has done more to create real estate value and to develop the modern city than any other single agency. Every individual in the community is benefited by good service and is inconvenienced by inefficient service. Service involves the ability to command facilities, and facilities can only be provided in case a corporation can secure capital. The community and its transportation facilities, therefore, have a common and single interest. The success, growth and prosperity of a city is dependent upon the co-ordinate development of its utilities.

We have maintained that adequate return to the investor in electric railway securities reacts so as to give better transportation facilities to the community. If oppressive regulation reduces the earnings of the utility company so as to imperil the principal or the return on the capital invested, the public will suffer for the lack of efficient transportation. There is no conflicting or divergent interest between the city and its utilities. The investor and the public prosper or suffer together. Each, therefore, has a common interest in promoting the prosperity of the other.

One of the knotty questions involved in many of the New York cases concerns provisions in the franchises fixing the maximum rate of fare at five cents. These franchises constitute contracts which were entered into in good faith by the company and the city. The corporations in accepting them intended, so far as possible, faithfully to observe their covenants, but the time has now come when it is impossible to operate with a five cent fare. We are advised by counsel that the courts of this State have held that attempts by municipalities to fix rates of fare through franchise stipulations are *ultra vires* because the Legislature specifically reserved the right to fix rates of fares and later conferred this right upon the Public Service Commissions.

It is very clear that the public interest is best served through a modern, efficient street railway service rather than by an inferior standard of service which a corporation might be able to provide at a five cent fare. Yet in many of the cases now pending the five cent fare does not yield sufficient revenue to pay operating expenses, a situation, which, of course, leaves nothing by way of return to the capital invested. Under such circumstances the choice is essentially between a higher rate of fare, a reduction in the quality of service, the abandonment of the property or municipal ownership. The fundamental question, we have urgently maintained, is the ability of the utility to give first class service; to extend its lines as communities develop and as traffic increases; to provide new equipment and to keep abreast of improvements in the art. The first and paramount consideration is the standard of service, and we have submitted that the all important test is whether the electric railways, on a five cent fare, can continue to give first class service.

The test of commission government of public utilities is undoubtedly at hand. It was very easy for the public service commissions to reduce charges of electric light companies and other public utilities in the days of decreasing costs, for such decisions brought popular satisfaction. It is quite another matter, however, in the days of increasing costs to raise rates, for rate increases are never popular.

Public service commissions the country over are face to face with the necessity of making the choice between a so-called popular decision and doing exact justice. If they refuse to give relief to the electric railways, they practically sign the death warrant of the industry. The source of capital will be closed. Additional facilities cannot be provided. Receivership will spread like a terrible blight. The growth in population and traffic, without a corresponding increase in facilities, will cause overcrowding and breakdown in the standard of service. The public will become dissatisfied and the end can scarcely be foretold. It is obvious that the investor in street railway properties will fare badly. It is equally obvious that the street railway as an investment proposition will be tabooed and it seems fair to conclude that both the public and the owners of electric railways will come to the point where municipal ownership will be inevitable. Indeed, unless the commissions grant relief, the owners of electric railway properties will be found urging municipal ownership as the only escape from an intolerable situation. The fight of the electric railways for higher fares involves essentially the fate of the experiment of public regulation of privately owned and operated utilities.

The problem now confronting the electric railway industry is a problem of public education. It is a problem of informing the people of the straits into which the industry has fallen.

The success of a democracy depends upon enlightened public opinion. Each passing year emphasizes the fact that political questions have become almost entirely questions of business policy. We are struggling with the problem of presenting business facts to the electorate. And it is our problem to convince the public that rates of fare must be fixed as in any other business, with due regard to all the costs of providing good service.

The electric railways, like other utilities, must demonstrate to the people that the best policy from the standpoint of the people, is one of liberality toward those who have honestly and in good faith invested capital in public utility enterprises.

The public must be shown that their interest is best served when capital receives a fair return in good years and in bad, and when their utilities are protected from short-sighted, dishonest and unscrupulous attacks. In return the community may expect and demand efficient, adequate and satisfactory service.

We must make the public see, and see clearly, that the increases in the operating expenses of the companies, have been caused by economic conditions over which they have had no control. Wages and the cost of materials of all kinds have steadily mounted.

We must show that these unfavorable conditions arose at a time when the electric railway was subjected to most severe competition.

The building of state highways, and the construc-

tion of modern improved street pavements, together with the almost universal introduction of gasoline and electrically driven vehicles both for pleasure and business, has revolutionized the position of the electric railway industry.

The electric railways have been prodigal in the service which they have provided. They have been giving six, seven and eight-cent service for which they have been receiving a nickel or less. The public must decide whether it wants five-cent service for a nickel or the present service, which costs six cents or more.

We have indeed come to the point where the nickel as the standard street car fare generally must be abandoned. Its abandonment may involve radical readjustments in the whole structure of urban rates. Is a flat increase from five to six cents the most desirable method? Under what conditions may a street railway company equitably charge for transfers? Under what circumstances, if any, does the zone system furnish the best solution?

These are questions which go to the very foundation stones of the business. They are questions which must be solved by the public utilities and not allowed to become political footballs or matters of commission caprice. Doubtless all of these methods will be tried.

The number of companies which have advanced rates amounts to nearly one hundred. The results which will follow these increases will doubtless be quite dissimilar. Of those charging a six cent fare some will have an increase in operating revenue approaching the theoretical maximum of twenty per cent, because the volume of traffic will show little decrease. In other cases the decrease in travel may largely neutralize the higher rate of fare.

It is the duty of the industry to carefully study all of these cases to ascertain why some companies fare better than others. We must be able accurately to forecast, through such a study, what results a company operating under given conditions can expect from a six cent fare. We must work out standards by which an intelligent decision can be made as to whether in a given case the wisest plan for increasing revenues involves a flat increase in the rate of fare, a charge for transfers, or the introduction of the zone system.

It is the duty of the industry to make such a careful, scientific and complete study of the results secured, that the fundamental principles may be clearly and unmistakably developed, and the limitations of each method of relief accurately measured. Such a task is not one which can be left to voluntary investigators who can afford merely to skim the surface of the problem. It is a subject which requires thoughtful, painstaking study by the leaders of the industry, reinforced by careful, scientific research.

It seems to me the best method of studying the questions which are before us is through the creation of a Committee of the American Electric Railway Association to be charged with the duty of making a careful, exhaustive and scientific analysis of the entire fare problem which is being completely opened up as the result of the abandonment of the nickel.

The value of such work to an individual company seeking higher fares is so obvious as to need no extended comment. It will save many false steps. It will furnish a basis of indisputable fact which no commission can afford to ignore. It will serve as the medium of educating the public concerning the true situation of the industry. It will blaze the trail leading to the financial rehabilitation of the electric railway.

SOCIETY FOR ELECTRICAL DEVELOPMENT PUSHING CHRISTMAS CAMPAIGN.

Electrical Industry Urged to Unite to Popularize Slogan "Give Something Electrical This Christmas."

A greatly augmented desire for conveniences and increasing purchasing power on the part of many are working to make this year the banner Christmas year for the electrical industry. The strong appeal of practical gifts for the home will bring scores of people into the electrical shops, where formerly they have been buying only toys and knickknacks. Realizing the trend of opinion, the Society for Electrical Development has planned a big nation-wide Christmas-gift campaign, as stated in our issue of October 6.

The general broadside announcing this campaign has been mailed to 20,000 firms and persons. The features of "America's Electrical Christmas" are outlined and information given regarding the display publicity material available to help the electrical industry get its share of the $200,000,000 annually spent for holiday presents.

Official Poster for "America's Electrical Christmas."

Remembering the success of Electrical Prosperity Week in 1915, America's Electrical Week in 1916, and Wire-Your-Home Time, central stations, manufacturers, jobbers and contractor-dealers will realize upon this opportunity. The electrical industry never has gotten its share of the big money spent in Christmas gifts. This is the first concerted effort in this direction and the time is opportune for an immense business.

The sales helps being prepared for the campaign with the slogan "Give Something Electrical This Christmas" include a special holiday edition of the monthly sales service of the society. Timely advertising suggestions will be given, special window displays will be shown, circular letters breathing the holiday spirit have been prepared and also the regular features of the popular service bulletin.

A special Christmas poster has been designed. It is illustrated herewith. This poster will be available for window displays, store cards, poster stamps and window cards. A transparency suitable to the holiday spirit with special reference to electrical gift suggestions will be available for windows and doors. A set

of special display and price cards have been designed, each card directing attention to the one appliance shown. These silent salesmen will almost sell the appliances themselves.

A new motion-picture feature has been prepared. Two human-interest scenarios have been produced for the Society by the Universal Film Manufacturing Company. The stories show the actual operation of electrical appliances with strong suggestions to "Give Something Electrical This Christmas." These films can be purchased outright for $15, so that they can be kept and used from time to time wherever and whenever the owner wishes. The dealer's name and address appears in the film.

The first broadside of "America's Electrical Christmas" has been fired. The plans for the campaign are well under way. To make every giver in the United States "Give Something Electrical This Christmas" should be the constant aim of every central station, manufacturer, jobber and contractor-dealer. By working together the electrical industry will get the share it should receive of the enormous totals that will be spent for gifts during the coming holiday season.

ADVISORY COMMITTEE OF ELECTRICAL INDUSTRY.

Attention Directed to Work of Signal Corps and the Quality of Men It Needs.

The State Council of Defense of Illinois, through its Chicago office, 120 West Adams Street, has appointed an Advisory Committee of the Electrical Industry, which is to determine ways and means whereby the members of that industry in Illinois may assist the Army, the Navy and other Government departments. This committee of electrical men directs attention to the needs of the Signal Corps in which electrical engineers, linemen, switchboard operators, wiremen, mechanics, chauffeurs, telegraph and radio operators and others are in demand. It is urged that electrical men of draft age learn the requirements of the Signal Corps and prepare themselves so they may readily classify for this service.

This Advisory Committee has prepared a Signal Corps folder, in red, white and blue, which is intended to appeal to the young man subject to draft, and to inspire him with the importance and responsibility of Signal Corps service in the Army. In modern army signaling the telegraph, telephone, radio, heliographic, the balloon and aeroplane methods of communication are all employed very extensively.

The committee referred to is made up of 25 electrical men. The consulting board of the committee consists of Louis A. Ferguson, Henry M. Byllesby and Bernard E. Sunny. The officers are Harry L. Grant, chairman; Homer E. Niesz, vice chairman; Arthur S. Huey, treasurer; Alvin H. Krom, secretary. All young electrical men should get in touch with this committee and be advised of its plans and purposes.

RECENT DEVELOPMENTS IN INCANDESCENT LIGHTING.

President of Illuminating Engineering Society Addresses Chicago Section on Important Subject.

George H. Stickney, president of the Illuminating Engineering Society, was the principal speaker at the meeting of this organization's Chicago Section held on October 18. He took for the subject of his address "Recent Developments in Incandescent Lighting," but before taking up the subject proper, he referred to the work and the status of the Society, calling special attention to the very important work now being done by several of its committees in aiding the Government in meeting serious problems of the times. He also called attention to the unbiased and influential position which the Society has and which fills needs that have not been met by any other organization.

Speaking on the subject proper, Mr. Stickney said that many important problems have recently been solved by lamp-manufacturing engineers, due to high prices and scarcity of materials, inferior quality of some of them and all such matters had to be solved promptly. He spoke of the disinclination of manufacturers to make special lamps on account of the very high cost of making the necessary special machinery required. Therefore illuminating engineers should, wherever possible, use standard lamps. The cost of special lamps is so high that their use is warranted in but few places. However, progress has frequently been made through the development of special lamps to meet some particular requirements. Mr. Stickney said that he often wondered why so many carbon lamps were still in use. In but few cases are they warranted and their extensive use is doubtless due chiefly to lack of education, such as permits an excessive number of drop cords to still remain in use. It is poor illuminating practice to use too many small lamps close together when a smaller number of larger lamps will do the work.

In store lighting there has been marked advance in utilizing the latest progress in lamp development, but in the industrial plants the conditions are far from being satisfactory on the whole. Mr. Stickney felt that it was a patriotic duty on the part of all who have knowledge of how industrial lighting can be improved to actively agitate this subject so as to increase the efficiency of factory production to a maximum. It is true that in certain industries important advances have been made in the lighting of their plants. In most cases, however, conditions are far from satisfactory. There is a tendency to simply put larger lamps in place of old ones on drop cords, forgetting that the larger the lamp the more glare there is produced from it if the lamp is not shielded sufficiently. He had hesitated to recommend the use of frosted lamps where bare lamps were insisted upon, but had found that these do not deteriorate as much in candlepower, even in very dusty places, as has formerly been supposed. Thorough cleaning will restore them to practically their original candlepower. The neatest solution to the glare problem is by the use of units approximating the indirect type, such as the Reflecto-cap-diffuser recently placed on the market. He spoke of the great advance made in protective lighting during the last six months. For this purpose either bracket or reflector units can be used or projector lamps. The latter are most effective when placed so as to be turned in one general direction, thus permitting the guards to remain in the darkness and enabling them to see perfectly the illuminated zone. An interesting application of a portable projector has been made at the Edison Storage Battery Company's plant, where a storage-battery type projector has been added to the fire-fighting equipment.

Respecting street lighting there is a noticeable tendency to use single units in place of clustered

lamps, this giving better efficiency and improved appearance. There is also more use of ornamental equipment, especially with post-top lamps; where such lamps are used it is necessary to specify the tip-up position because otherwise pendent lamps are supplied. A new development in this line is the use of a stipled globe, with an inner prismatic refractor. The use of large fixtures with large radiating surface eliminates the need for ventilating the lamp housing and lamps in such fixtures really run cooler than in smaller ventilated fixtures.

Mr. Stickney referred to color variation, which is obtained principally for three purposes: First, whitening the light; second, yellowing the light; third, production of other colors. It must not be forgotten that the change of color of an incandescent lamp is obtained only through subtracting some of its rays through filtration, either with an external screen or a colored glass bulb. Where it is necessary to secure the closest approach to true daylight the use of Moore carbon-dioxide tubes gives the best results—the use of which is attended with some disadvantages however. Incandescent lamps for this purpose must be always a compromise between accurate daylight and efficiency. Where it is necessary merely to get an approximate daylight the type C2 Mazda lamps prove very satisfactory. They are used not only for store-window lighting and in stores, but also in certain laundries where it is desired to detect the presence of yellow stains; they have been used also for a great many other purposes, including ore concentration, where certain zinc and iron ores are separated.

One of the most important recent developments is the use of specially prepared incandescent lamps for moving-picture projection. The use of the coiled-filament type C Mazda lamp has made this possible. These lamps have a filament area about one-half inch. They are low-voltage lamps operating at 25 or 30 volts and taking 750 or 600 watts. They are operated at very high efficiency at the sacrifice of life, which averages about 100 hours. They have marked advantages over the alternating-current arc lamp and over all but the largest direct-current arcs. They can be used in all but the largest movie theaters.

Participating in the discussion were E. H. Freeman, chairman of the Chicago Section; J. R. Cravath, J. Stair, L. Friedman, Morgan Brooks, E. H. Meyer and Mr. Stickney. In closing the discussion the latter spoke of the special lighting of some roadways along dams of the Catskill Aqueduct, where a very low mounting is being used. Respecting colored lighting Mr. Stickney felt that it is doubtless going to be used quite extensively, although not just now. He believes the yellow tint will be used considerably. Colored lighting will probably be obtained best by the use of colored screens, as this is less expensive than the use of colored bulbs.

Electrical Industry Did Full Share for Liberty Loan.

The electrical industry, through thorough organization, made very effective its campaign for the purchase of the Second Liberty Loan Bonds. The Jovian Liberty Loan Committee of The Jovian League of New York City presented to its members a vigorous appeal, first as a patriotic duty, and second, as the safest kind of an investment. The results tell of the effectiveness.

The Commonwealth Edison Company, Chicago, evolved a plan whereby its employees who had subscribed for the first loan but who could not readily increase their payments, could purchase Second Liberty Bonds. The plan offered was as follows: The company will buy the bond or bonds of the First Loan outright from the employees, crediting the amount already paid by the employee on the First Loan to his subscription on the second. Or, in other words, if an employee has paid $25 on a bond of the First Loan, the company will apply this $25 on a bond of the Second Loan, cancelling the employee's obligation on the First Loan entirely.

Many other cases of co-operation between utility companies and their employees to make the Second Liberty Loan a success are everywhere in evidence.

A feature of the Liberty Bond sales campaign in Louisville, Ky., was the subscriptions from business organizations in the name of the companies as well as the individual subscriptions of the officers and employees of these companies. The Louisville Gas & Electric Company subscribed for $100,000 of the bonds, while its employees purchased an additional $20,000, through the company, which is assisting in financing of their purchases. There was a three-day drive held in Louisville, during which the maximum allotment of the city was raised, with some additions made later. The gas and electric company was represented in the organization by L. S. Mayer, auditor; W. D. Meyers, engineer of sales, and E. D. Wood, electrical engineer. Others of the electrical fraternity who participated in the campaign were Samuel Riddle, superintendent of transportation of the Louisville Railway Company, and Frank H. Miller, superintendent of motive power of that company.

The Kansas City Light & Power Company helped its employees to buy Liberty Bonds of the second issue. A plan for small payments to be taken from the employee's salary was offered by the company. About $18,000 was subscribed early.

Work Begun on Large Modern Power Plant for Kansas City.

Contracts have been let for the new $4,000,000 power plant of the Kansas City Light & Power Company which will be erected at the foot of Brooklyn Avenue in Kansas City, Mo. The company announces that the new plant probably will be in operation within about a year or about November 1, 1918.

Work on the foundation has already been started. It was found necessary to go to a depth of 60 feet to find a solid gravel bed for the foundation.

Sargent & Lundy, Chicago, have designed and will supervise the construction of the entire project. The General Electric Company will furnish the turbo-generators; Worthington Pump & Machine Company, the condensers; Babcock & Wilcox Company, boilers; Sanford Riley Stoker Company, stokers; Green Fuel Economizer Company, fuel economizers.

The plant is designed to be as efficient and modern a plant as can be installed in the United States at this time, according to the designing engineers.

Electrical Contractors of Utah Organize.—Utah Society of Electrical Contractors and Dealers held its first meeting at Salt Lake City on October 4 and 5. Officers elected are: J. V. Buckle, president, Salt Lake City; Le Grand Robbins, vice-president, Salt Lake City; W. L. Taylor of Logan, E. H. Eardley of Salt Lake City, L. R. Bourne of Provo, V. B. Phillips of Brigham City, and E. A. Brough of Montpelier, Idaho, constitute the executive committee.

Notes on Commercial Practice

New-Business Methods, Policies, Rates and Kindred Central Station Matters for the Man Engaged in Selling Electricity

Commonwealth Edison Company Offers Liberal Educational Courses for Employees.

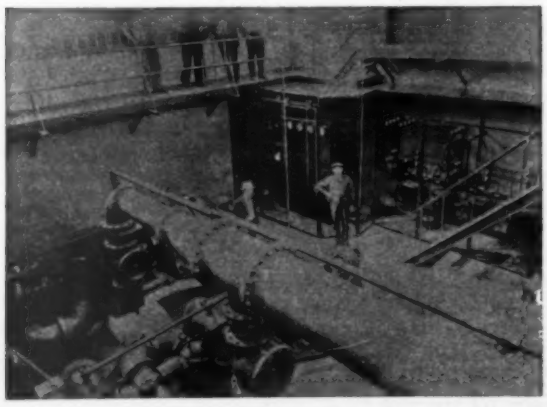
The Commonwealth Edison Company in co-operation with the Chicago Central Station Institute has offered several optional educational courses designed for the improvement and further training of its employees. They are National Electric Light Association educational courses, and are specially offered to employees who are members of the Commonwealth Edison Section of that association. The company offers to advance to the association the cost of the course or courses the employee may choose, the amount to be returned to the company in small monthly payments. However, one-half of the tuition fee is to be refunded to the employee on satisfactory completion of the course. The Chicago Central Station Institute will conduct a monthly class in each course.

The courses are outlined as follows: Ten lessons in Practical Electricity; seventeen lessons in Commercial Engineering; seven lessons in Elementary Bookkeeping; thirty-six lessons of a highly specialized course in Electric Utility Accounting. The courses are all conducted by the correspondence method, although meetings are to be held for purposes of discussion. The courses are more fully outlined in a booklet prepared by Fred R. Jenkins, manager of the Chicago Central Institute, 1647 Edison Building, Chicago.

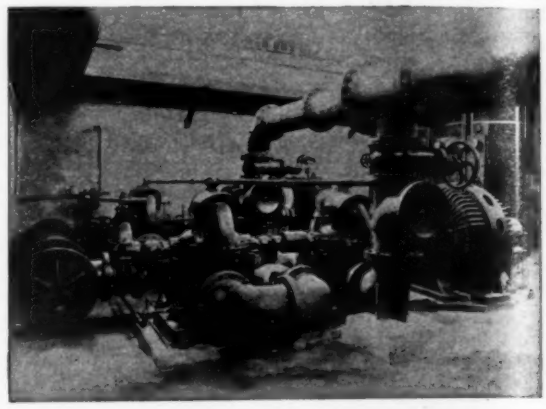
Synchronous Motors Drive City Water Pumps.

Water pumping, on account of its high load-factor, is a load which many central stations have found profitable. One of the more recent installations of this character is that supplied by the Camden Iron Works for the Delair plant of the Camden, N. J., water-supply system. This consists of two pumps having a total capacity of 10,000,000 gallons per 24 hours.

A neat brick building houses the apparatus which is placed about 12 feet below ground level. There are two 12-inch centrifugal pumps, single-suction, two-stage, each connected through a horizontal shaft to a 200-horsepower Westinghouse synchronous motor. There are also two rotary vacuum pumps each connected to a 10-horsepower Westinghouse induction motor.



General View in Pump Room Showing the Two Main Two-Stage Centrifugal Pumps, Switchboard and Transformers.



Near View of One of the Main Pumps, Showing Synchronous Motor and Exciter at Right End.

Power for this station is received from the lines of the Public Service Electric Company at 2200 volts, and used in the main pump motors at this voltage. Transformers are provided to serve the vacuum pumps at 220 volts, and for lighting.

The switchboard has three panels, one for each main pump motor, carrying the necessary relays and switches, and an ammeter and reactive-factor meter; there is also a metering panel carrying the central station's kilowatt-hour meter and a curve-drawing instrument. The smaller pumps are controlled from switches near each one.

During a test run, these pumps operated against suction heads of 27.33 and 26.5 feet, respectively, and a pressure head of 150 feet. In spite of the fact that the water contained some air, the high over-all efficiency of about 72 per cent was achieved, involving consumption at the rate of about 160 kilowatts.

It is readily possible by the use of the reactive-factor meters and regulation of the synchronous-motor field to secure any power-factor desired. This makes it possible to keep the station at unity power-factor or to supply leading current to improve conditions in the district. Since the pumps can be run at any time, it is often desirable to shut them down at the times of heaviest load on the central station.

Central-Station Power for Reading Railway Shops.

The Metropolitan Edison Company, of Reading, Pa., has just made a contract with the Philadelphia & Reading Railway Company to furnish the company with 1000 horsepower for its locomotive and car shops in the northern section of the city. The shops have

outgrown their present steam-power equipment and the new electric power is to be added as an auxiliary. To supply this power, the Metropolitan Edison Company will build an extension to its 13,000-volt line now terminating at the Carpenter Steel Works, in order to give the car shops a direct connection from the West Reading power plant.

Increased Business of Minneapolis Central Station Necessitates Enlarged Office Building.

Steadily increasing business necessitated enlargements to the Minneapolis General Electric Company's office building on Fifth Street, which have been in progress for several months and are rapidly being completed. The securities department now occupies its new quarters on the third floor. The cashier's, contract and appliance departments will soon occupy their new quarters, and the Electric Cooking Bureau will be established in the lobby on the first floor. Thus each branch of the business will have more office room for regular work and future expansion.

Typical of the activity of the company is the record of its sales department, which during the week ended October 13 secured 504 new electric light and power customers with 257 kilowatts of lighting and 260 horsepower in motors, and took contracts for wiring 35 already built houses. New business connected to the company's lines includes 157 customers with 68 kilowatts of lighting and 284 horsepower in motors. The electrical energy output for this period shows an increase of 15.7 per cent over the corresponding period a year ago.

Electric Power Supplanting Steam in Ice-Making Plant.

The Boyle Ice Company, 136 West Lake Street, Chicago, is installing electrical equipment in its ice-making plant at 1125 Eddy Street, to carry out its plan of changing from steam to electric power. A contract was made with Commonwealth Edison Company to build and equip a substation at the plant, to furnish 20 motors of a combined capacity of about 600 horsepower, and to supply power at 12,000 volts, to operate the ice-making machinery. The steam engines and all steam-power accessories are being discarded. The three ammonia compressors are to be driven by two 200-horsepower motors and one of 35 horsepower. Other motors required are for the condensing water tower, brine circulation, brine agitation, a horizontal propeller, ice elevator, brine pumps and air compressors. The pumps being installed are supplied by the Detroit Pump Company; they are the centrifugal type, direct-connected to the motors. The motors and transformers being installed are of the General Electric manufacture.

The Boyle Ice Company is expending about $35,000 on new equipment, and installations required in making the change. The reconstructed plant is to be in service by January, 1918. The consumption of electric power at this plant will amount to about 1,700,000 kilowatt-hours per annum.

Important Power Contract With Steel Company.

The New Jersey Power & Light Company, Dover, N. J., has signed a contract with the Wharton Steel Company for 4300 horsepower, which makes a total of 5800 horsepower signed for by this company during the past month. These contracts take care of the requirements of three iron-ore mines—Scrub Oak mine, 2000 horsepower; Oreland mine, 3000 horsepower; Andover shaft, 800 horsepower. The steel company expects these three mines to take care of its furnaces, which have a capacity of about 1200 tons of pig iron per day. These motors will be connected to pumps, air compressors and crushers, will run 24 hours a day, and will have a load-factor of about 50 per cent. One of these mines has already been connected up, and the other two will probably be connected up within the next six weeks. The Wharton Steel Company expect to have its entire 5800 horsepower connected up within the next three months.

The New Jersey Power & Light Company will get at least 1½ cents per kilowatt-hour from these contracts, and it will cost about $8,000 to make the necessary connections. The above contracts will represent the largest single consumer on the company's lines and the company will derive approximately $70,000 a year in gross earnings therefrom.

Increased Cost of Living Urged as Reason for Rate Increase.

"The steadily increasing cost of everything entering into the operation of its properties and construction of extensions of its service" has made costs of rendering good service so high that Kentucky Public Service Company, Bowling, Green, Ky., has applied to the City Council for authorization of a "nominal" increase in the electric and gas rates. The electric rate has been limited to 8 cents a kilowatt-hour. In its request the position of the company is presented as follows:

"Because of the great advance in the cost of living our employees are entitled to an advance in salary and wages paid, and should receive it, yet the company has not been able to do this on account of the limit fixed in the selling price of its products. The high cost of living has affected us more than it has the average household or business, but, even at that the government census figures show that gas and electricity are practically the only things entering into the cost of living that have actually decreased in the past ten years."

Big New Shipbuilding Plant at Sandusky Will Use Central-Station Power.

The Lake Erie Dry Dock & Engineering Company has been incorporated with a capital stock of $1,600,000. Engineers and draftsmen are now preparing estimates and specifications preparatory to letting of contracts for the work necessary to dredge channels, build shipways, docks, etc., at Sandusky, Ohio. The company will build standard steel ships for ocean as well as lake-going purposes. Central-station power will be supplied by the Sandusky Gas & Electric Company. It is probable that this new industry, which will be the largest in Sandusky, will require about 600 horsepower at the start.

Successful Appliance Campaign.—The appliance sales campaign of the Louisville (Ky.) Gas & Electric Company in connection with its three-cent rate for excess consumption has now reached the stage where electric ranges are being sold rather readily to the well-to-do, especially to those who reside in country homes.

Notes on Operating Practice

A Department Devoted to Practical Problems of Plant and Operating Practice With Particular Reference to Electrical Generation and Distribution

PULVERIZED COAL AS FUEL FOR POWER-PLANT BOILERS.

Good Results Obtained in Plants Where It Has Been Used.

For several years the use of pulverized coal as power-plant fuel has been advocated as a means of improving the efficiency of combustion and a great deal of study and experimental work has been devoted to the subject. The successful use of this fuel requires close attention to several important features, neglect of which prevents obtaining the best results.

Pulverized coal was first applied successfully for economical reasons in the burning of Portland cement where extremely fine grinding of all the materials is required. It was found that by similar fine grinding of the coal the most economical and satisfactory results were obtained. Between 30,000,000 and 50,000,000 tons of pulverized coal have been used to date in the manufacture of cement alone.

The development of this fuel has been reported on by H. G. Barnhurst, chief engineer of the Fuller Engineering Company, of Allentown, Pa., which has specialized on the necessary equipment. He states that the application of this ideal form of fuel has been gradually taken up by engineers connected with other industries, who have speedily recognized its value to such an extent that the steel industry today is using in the neighborhood of 2,000,000 tons of pulverized coal annually in various types of furnaces, such as open hearth, heating, puddling, soaking pits, continuous heating, reheating, annealing, forging furnaces and furnaces of practically every description where heat is required, and it is being used successfully. In several other industries, such as ore smelting, lime burning, etc., this fuel is coming into extensive use.

Of special interest is its use in power houses. There are quite a number of such installations now in successful operation using in the neighborhood of 100,000 to 200,000 tons of pulverized coal annually, and the success obtained by these plants has created so much interest and has brought out so strongly the desirability of the use of this fuel for power purposes, that today there are a number of new installations now being made, and by engineers of national repute.

The peculiar conditions as they exist today on account of the war and for other reasons, such as the gradual disappearance of sources of fuel, such as natural gas, and the shortage in supply of crude oils which have become of too much value to be used for ordinary fuel purposes, have compelled those interested to carefully investigate the possibility of the adoption of pulverized coal to replace their present expensive methods of operation and high cost of fuel.

Practically any coal can be burned in pulverized form with a proper furnace and burning equipment. Each application, however, must necessarily be governed by the quality of the fuel available in the district in which it is made. Generally speaking the coals which would give the most satisfactory results would be those in which the ash content would be less than 10 per cent, the volatile averaging between 30 and 40 per cent and the fixed carbon between 40 and 50 per cent. The sulphur content should be low, although coal with a sulphur content running as high as 4½ to 5 per cent is being burned in pulverized form under boilers without any detrimental results. The ash should have a high melting point. These statements, however, are tentative, as most excellent results have been obtained from all sorts of coals, differing widely from the ideal analysis stated.

It is very apparent that the development in this method of burning coal has brought coals from which heretofore very inefficient results have been obtained within reach of a great many consumers. For instance, lignites, and mineral coals, coke breeze, anthracite washery-waste coal, etc.

As regards preparing and handling of pulzerized coal, it is to be noted that the coal as received is either in the form of slack, lump or run of mine, and as it comes to the pulverizing plant it should be crushed so that it will go through approximately a one-inch ring. A single-roll coal crusher of approved make is usually the equipment. The coal should then be dried at low temperature to eliminate the moisture. Ordinarily it should be dried so it will not contain more than one per cent of moisture. A low moisture content in the pulverized coal as fired in metallurgical or other furnaces leads to uniform temperature conditions which are highly desirable. This condition is also necessary in order to obtain a product of the highest quality. The highest efficiency is also obtained with dry coal.

The drier is usually of the rotary type; that is the coal is fed into an inclined shell mounted on rollers and is gradually passed through the drier by gravity. The firing chamber is usually located under the shell or so arranged that the products of combustion from the drier can be used not only to heat the shell of the drier but also to pass through it in order to obtain the greatest economy from the coal burned for the purpose of drying the coal.

The drier should be so arranged that the gases of combustion coming from the furnace do not come in contact with the coal being dried until they are reduced in temperature so they will not ignite the coal. The temperature of the coal being dried should only be sufficient to drive off the moisture; if the coal is allowed to become too hot, the volatile contents may be reduced, thereby sacrificing some of the heat value of the coal. This condition is very readily obtainable, as practice has shown. A pyrometer should be installed to indicate to the operator the temperature to which the coal being dried is exposed. An evaporation of from 5 to 7 per cent of moisture from the coal being

dried can be readily obtained per pound of coal burned on the grates in the drier. The amount of evaporation naturally depends upon the quality of the coal being handled in the driers. The driers can also be fired with pulverized coal, if desired.

A magnetic separator of some standard make is installed either before the crusher or after the drier so as to remove what may be called tramp iron, which consists of pick points, railroad spikes, coupling pins, links, hammer heads, sledges, tobacco cans, nails, etc., all of which have been accumulated, either from the mines or in the crushing operation at the mines. This is an item of such importance that magnetic separators are being installed in every first-class pulverized-coal plant which is now being erected. The elimination of this iron naturally improves the pulverizing and conveying operation and prevents breaks and losses due to intermittent operation and wear and tear of the machinery.

Coal as it is passed through a modern pulverizing plant should be elevated and conveyed in dust-tight equipment. After crushing, the coal should be elevated to bins above the driers. These bins should be of ample capacity and arranged with variable-speed feeding mechanism so that the driers at all times will have uniform feed. This is very important so that the moisture content will be reduced uniformly and thereby allow close furnace regulation where the fuel is burned. All storage bins should be of dust-tight construction, and equipped with deep hopper bottoms so that the coal is constantly in motion while being drawn off. It is in coal lying dormant or stationary that spontaneous combustion or smoldering action is generated, particularly so where coals are under pressure.

The danger of spontaneous combustion of pulverized coal has been greatly exaggerated. It has been considered that the matter of pulverization increases this danger, but it is a matter of fact that practically nothing more than the usual ordinary precautions taken with all fuels are necessary to guard against it.

Pulverizers of ample capacity to take care of the fuel requirements should be of such a nature that their cost of operation, attendance, power and repairs are at a minimum. A first-class pulverizer should be one which can operate if necessary over a period of from one to three months continuously without shutting down even for oiling. The pulverizers should also be of a type that normally delivers a product containing the highest percentage of impalpable powder. Coal should be pulverized so that ordinarily 95 per cent will pass a 100-mesh sieve. The machinery in the pulverized coal plant where possible should be driven by electric motors. The drives should be standardized and the motors interchangeable. Back-geared motors are successfully used in a great many installations, and the pulverizers can be driven either by motors with belt drives or gear drives with a flexible coupling between motor and pulverizer.

Dust collectors are sometimes installed in connection with driers. This dust is formed by the action of the coal passing through the drier; as the coal falls down a certain amount is ground to dust and this dust, being in suspension, is carried along by the air currents through the drier; the dust collector will recover it. A dust collector should also be arranged in connection with the pulverizers.

The adoption of pulverized coal for any particular operation naturally depends on the cost of preparation or handling, which is a charge in addition to the fuel itself, which charge, however, in a great many cases is less than that where lump coal is used. The power required in a first-class pulverized-coal plant per net ton of coal handled is in the neighborhood of 17 horsepower-hours per ton produced. This includes the power for crushing, drying, elevating and conveying, and delivering the pulverized coal to the conveyors leading to the point of use. The repairs vary slightly with the quality of the coal being handled, but generally speaking the repair costs for the pulverizing plant should be somewhere between 5 and 7 cents per net ton of coal handled.

The drier fuel is practically a constant, as the amount required per ton of coal dried with a given moisture content with standard driers will not vary very much. In the Lehigh Valley district, where the coals carry from 5 to 10 per cent of moisture as received, 25 to 35 pounds of coal are required to be burned on the grates per ton of coal dried. The great variable in the cost of preparation in pulverizing coal comes down to the labor item. The labor varies inversely with the quantity of coal handled and the time or continuity of operation in the pulverizing plant. Generally speaking, coal in fairly large quantities from 50 to 100 tons and upwards can be pulverized and delivered to the furnaces at a cost from 20 to 50 cents per ton, depending upon the quantity handled.

To make a positive statement as to the cost of any given sized pulverized-coal plant today is rather difficult, in that the conditions governing every installation vary; generally speaking, however, an ideal plant with a capacity of 100 tons of pulverized coal daily will cost today with the present prevailing high prices in the neighborhood of from $300 to $400 per ton of coal pulverized. The cost of a plant for 250 tons daily capacity of pulverized coal will be from $250 to $300 per ton. To the cost of the pulverizing plant there must naturally be added the cost of the conveying system to the furnaces, also the storage bins, burners, etc., as well as the air supply.

When making comparisons between different methods for burning coal, and in order to be fair and just, the cost of each equipment should be considered from the time the coal is received on the track until it is delivered into the furnace. The cost of preparation of pulverized coal as stated above would sometimes lead one to believe that the cost is excessive and that it is a cost due entirely to the pulverizing of the coal, but cost of preparation as outlined above includes items which are common to any system of mechanical firing.

At the railroad shops of the Missouri, Kansas & Texas Railroad for over a year pulverized coal has been in use under the boilers with very satisfactory results. These boilers have been operating continuously day and night—for short periods daily at from 150 to 180 per cent rating. Practically no repairs to furnace arches or walls have been made during the year's operation. Absolutely smokeless operation has been accomplished. The flue gas analysis during some of the recent tests has varied from 15 to 17 per cent. Coals carrying on an average of from 10 to 22 per cent of ash with a moisture content varying up to 17 per cent as fired are being burned satisfactorily. The furnace efficiency has been very nearly perfect; three tests made in June showed a furnace efficiency of 98.4, 98.6 and 99.4 per cent.

The pulverizing action increases the superficial area of the coal, thereby rendering its combustion far easier of accomplishment and more complete, since each minute particle will be surrounded by sufficient

air to insure its combustion. It is evident also that the more finely divided the coal is the more readily it can be satisfactorily burned, and under proper conditions is absolutely smokeless.

The serious attention which is being given to this subject by many of the progressive central-station companies and power-plant engineers, indicates that within a few years marked changes may be seen in the design of steam generating plants, particularly where cheap, low-grade fuel is at hand and high-grade coal is expensive.

In the course of a conversation with a representative of the ELECTRICAL REVIEW, H. R. Collins, mechanical engineer of the Fuller Engineering Company, made the interesting statement that with very low-grade fuels it was possible to develop power at a fuel cost of 3 mills per boiler horsepower-hour. This, of course, brings lignite of the Dakotas and the low-grade coals of Kansas and Nebraska for serious consideration by central-state companies in those localities where the cost of high-quality coal is now practically exorbitant.

Two Reports on the Effects of Storage Upon the Properties of Coal.

A very timely report on the deterioration in the heating value of coal during storage, covering a five-year period, has just been issued by the Bureau of Mines, Department of the Interior, as Bulletin 136, Horace C. Porter and F. K. Ovitz being authors.

The tests show that the amount of deterioration of coal in heating value during storage has commonly been overestimated. Except for the subbituminous Wyoming coal, no loss was observed in outdoor weathering greater than 1.2 per cent in the first year, or 2.1 per cent in two years.

The loss in heating value is given for New River and Pittsburgh coals during five years' storage in the open air and under water, for Pocahontas during two years' storage in the air, and for Sheridan, Wyoming, coal during two and three-quarters years' storage in the air.

The tests with New River and Pittsburgh coal were made to determine the advantage to be gained by storing coal under water, and particularly under salt water. The results show that storage of New River coal under water effectively prevents deterioration of calorific value and that storage in the air under severe conditions causes only small deterioration, about one per cent in one year's exposure and about two per cent in two years. After two years the loss is continuous but slow, reaching 2.5 to 3 per cent in five years. The deterioration of Pittsburgh coal during one year's open-air storage was practically negligible. During the second, third, fourth and fifth years the deterioration proceeded very slowly and did not reach an amount greater than 1.1 per cent in five years. The submerged portions suffered no loss measurable by the degree of accuracy of the methods used.

The tests of Pocahontas coal, a semi-bituminous type, were undertaken chiefly to determine the effect of tropical conditions in Panama. They were made on an outdoor pile of 100 tons of run-of-mine coal. During two years' outdoor exposure this coal deteriorated less than one per cent in heating value.

The Sheridan, Wyoming, subbituminous coal, known also as "black lignite," is commonly supposed to deteriorate rapidly in storage, especially by "slacking" or crumbling of the lumps. Under the conditions of the tests this coal lost 3 to 5.5 per cent of its heat value in two and three-fourths years' storage, the greater part of this loss being in the first nine months. In general, the lumps became badly cracked, but retained their form sufficiently to permit ready access of air. However, they were weakened so that they broke up badly on handling. By the use of bins with air-tight bottoms and sides and a protecting layer of fine slack on the surface, the deterioration of Sheridan coal in heat value can probably be kept below 3 per cent in one year and the physical deterioration can also be largely prevented in the under portions of the pile.

The results show that the amount of deterioration of coal in heating value during storage has commonly been overestimated. With coal such as New River and Pittsburgh the expense of under-water storage equipment is not justified except as a preventive of fires from spontaneous combustion.

Detailed results and a full account of the tests and analytical data are given in the bulletin, which may be obtained free of charge by addressing the Director of the Bureau of Mines, Washington, D. C.

EFFECTS OF STORAGE UPON THE PROPERTIES OF COAL.

A similar series of experiments, started in 1910, to determine the effects of storage upon the properties of bituminous coal has recently been completed by the Engineering Experiment Station of the University of Illinois. The object has been to devise methods of storing which will avoid the risk of spontaneous combustion and to determine the extent to which coal deteriorates in storage.

Prof. S. W. Parr, under whose direction the tests have been conducted, summarizes the results in Bulletin No. 97 of the Engineering Experiment Station. It is shown that, if properly sized and carefully handled, coal may be stored without danger of spontaneous combustion; that the actual loss of heat value, or deterioration, resulting from storage is slight; and that underwater storage eliminates entirely all risk of spontaneous combustion or of deterioration. The extent of the waste and economic loss incident to the present method of seasonal production, with its attendant abnormal demands upon transportation facilities is discussed, and it is estimated that the lack of storage facilities in large distributing centers necessitates a capital investment in mines and railroad cars of $500,000,000 in excess of the amount which would be required if production could be maintained at a uniform rate throughout the year.

Copies of Bulletin 97 may be had without charge by addressing C. R. Richards, director of the Engineering Experiment Station, University of Illinois, Urbana, Ill.

New 15,000-Kilowatt Unit Increases Economy of Operation.

Installation of the new 15,000-kilowatt turbogenerator for the Louisville Gas & Electric Company, Louisville, Ky., has been completed and it was placed in operation October 3. This makes the total generating capacity of the Louisville company 32,500 kilowatts. It is anticipated that the new turbine will materially reduce the coal consumption per unit of energy. The Engineering Department of H. M. Byllesby & Company, under whose supervision the recent improvements and enlargements were designed and executed, is now at work on plans for the installation of another 15,000-kilowatt unit, which has been ordered for delivery in August, 1918.

Electrical Construction Notes

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

MACHINES FOR STRAIGHTENING BENT CONDUIT.

Simple Equipment for Reclaiming Bent Pipe or Conduit that Would Otherwise Be Discarded.

By Terrell Croft.

The straightening of bent conduit is a subject of economic importance. On every electric construction job a certain amount of conduit is bent incorrectly. Such material may, unless the situation is watched closely, be thrown away or hidden and thereby its value lost. This statement is of particular importance at the present time of high cost of materials and it applies with special emphasis where the conduit is of large diameter. In making alterations also conduit may be removed, the bent portions of which would be discarded if no means of straightening were available.

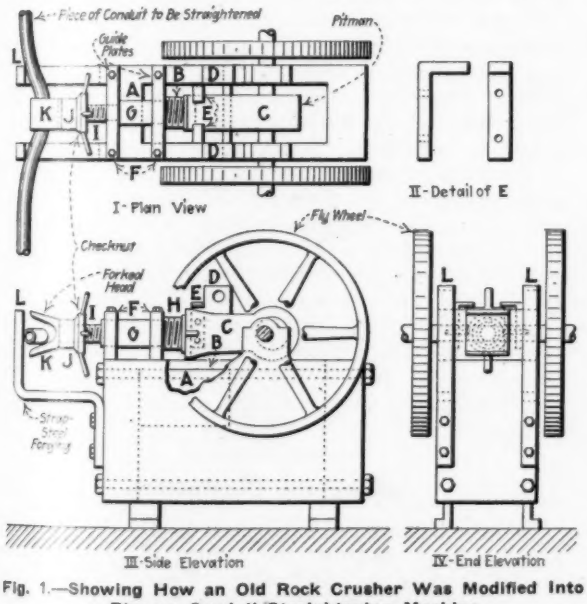


Fig. 1.—Showing How an Old Rock Crusher Was Modified Into a Pipe or Conduit-Straightening Machine.

A straightening machine should be installed in every shop or for any large job, whereby bent pieces of conduit can be straightened at minimum cost. It is usually considerably cheaper to straighten conduit with a power-operated machine, located in a properly fitted shop than it is for the wiremen to endeavor to straighten the pipe on the job with improvised apparatus. A big job, however, such as a large office building, may justify the temporary installation of a conduit straightener in the building during the period of construction. But, as a rule, it is probably the best practice to install the straightener at the shop and to haul to it, from the different jobs, all of the pipe lengths which should be straightened. Then the straightening can be done on rainy days or at odd times when the men would not be otherwise employed.

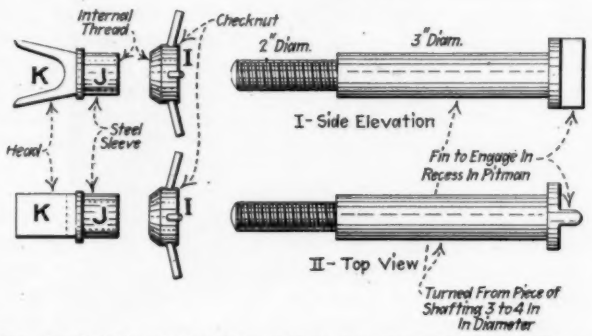


Fig. 2.—Details of the Ram "G" in the Straightener of Fig. 1.

The principle of operation of a straightening machine can best be understood by describing the construction of one. So far as it is known, no manufacturer regularly makes a pipe-straightening machine, hence each concern must construct its own. The device consists primarily of a ram or plunger, which is slowly oscillated longitudinally to or fro by a crank or pitman. The conduit to be straightened is held, by suitably placed stops, in front of the ram in such a way that, as the ram comes forward, it pushes against the bend in the conduit and straightens it out. Obviously, a machine which can be used for straightening wrought-iron pipe can also be used for straightening conduit, or vice versa.

Examples of improved straightening machines are shown in Figs. 1 to 4, all of which were described by C. Carleton Semple in The Engineering and Mining Journal for February 19, 1916. The straightener shown in Fig. 1 was assembled from a discarded rock crusher of the jaw type and, as it illustrates the elements of a typical machine, therefore it will be described in detail.

In assembling this particular straightener the toggles, jaw and jaw plates were removed from the crusher. The frame, pitman *C*, its shaft and eccentric, the driving pulleys and the flywheels were retained. A plate of metal *B* was fastened to the top of the frame upon which the pitman *C* could work back and forth. Two guides *E* were bolted over the top of the pitman to prevent its moving upwardly. Then the ram *G* (which is detailed in Fig. 2) was arranged to move in two guide plates *F* and *F*, each of which was 6 inches high and 1 inch thick.

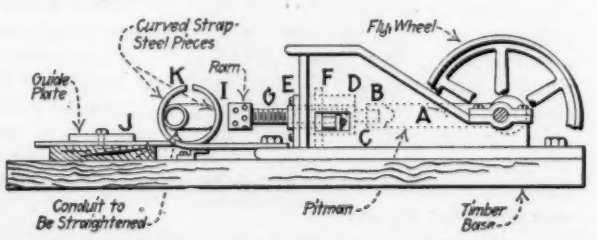


Fig. 3.—A Readily Arranged Power-Driven Conduit Straightener.

The ram (see Fig. 2 for detail) was turned from a piece of shafting, with a screw thread on one end and a flange, having a fin extending from it, on the other. The fin is provided to engage in the slot in the pitman as shown in Fig. 1, *III*. At the left end of the ram a screw thread was turned to accommodate the checknut *I* and the internally threaded sleeve *J*. The head *K* is fastened to the sleeve. A spring *H* (Fig. 1) is provided to insure the return of the ram, when the pitman is drawn to the right-hand position.

In straightening a piece of conduit with the straightening machine it is, as shown in Fig. 1, placed against the strap-steel stops *L* with the bend in it toward the head of the ram. Then the head *K* is so adjusted by turning it (and it is locked in place with the checknut *I*, after it has been properly located) that it will push the bend out of the conduit as the ram slowly moves toward the extreme left-hand position.

A simple conduit straightener is shown in Fig. 3 and some of its details are illustrated in Fig. 4. This machine was also assembled from parts of a discarded rock crusher and employs an oscillating ram in much the same way as does the machine shown in Fig. 1. In using the straightener of Fig. 3, the conduit to be straightened is placed within the curved strips of strap steel *I* and *K*. As the ram, driven by its pitman *A* pushes toward the left it forces curved strip *I* with it against the bend in the conduit. By suitably adjusting the distance of the head *H* from the ram, pipes of different diameters may be straightened. The sliding curved strips *I* operates in a guide (as shown at *J*, Fig. 3) which restrains it in its proper line of motion.

In Fig. 4, *C* is a hollow cylindrical piece of steel which is internally threaded so that piece *G* with its head H will turn into it. The location of *C* in the assembled machine is suggested in Fig. 3. The cylindrical casting *D* constitutes, as is indicated in the assembly, a guide for *C*. At *E* is given the detail of the two plates whereby the guide cylinder *D* is maintained in the correct position.

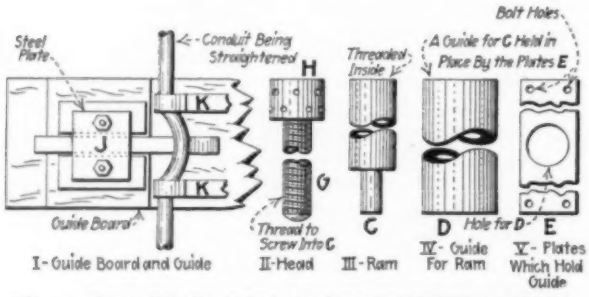
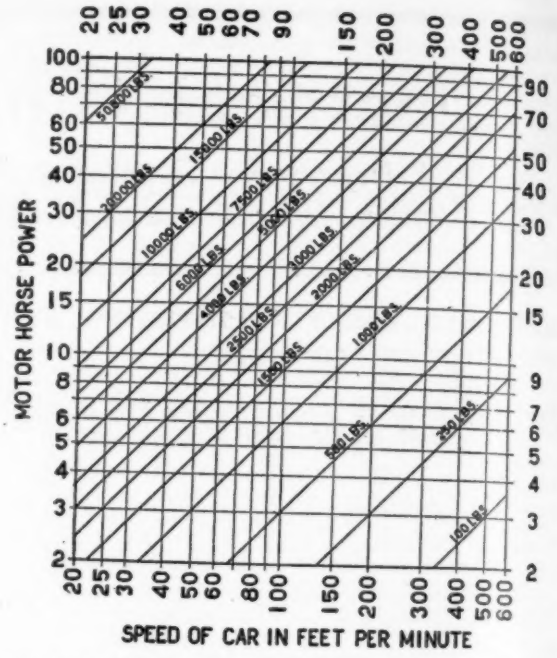


Fig. 4.—Some Details of the Straightener Shown in Fig. 3.

Simple Determination of Size of Motor for Elevator Drive.

The electrical contractor, as well as the operating electrician, is frequently called upon to install electric drive on an elevator. Where the elevator is entirely new the size of the motor required for its operation is usually determined by the manufacturer supplying the elevator, who has complete data and formulae available for this purpose. However, where it is a case of changing over to electric drive, it is desirable to have some convenient means of determining the proper size of motor to use.



Simple Chart for Determining Horsepower of Elevator Motor.

In a paper presented before the recent Milwaukee meeting of the Elevator Manufacturers' Association of the United States, by H. P. Reed, electrical engineer with the Cutler-Hammer Manufacturing Company, a diagram was included which permits in a very simple way the instant determination of the proper size of motor. There are three factors that determine the horsepower of an elevator motor. These are: Net weight to be hoisted, car speed and over-all efficiency. In the accompanying diagram an efficiency of 50 per cent is assumed for the entire equipment. To determine the size of motor to be used, follow the diagonal line corresponding to the unbalanced load, to the point where it crosses the vertical line corresponding to the speed of the car in feet per minute. The horizontal line passing through this point indicates the horsepower of the motor desired. If the efficiency is known to be something else than 50 per cent, divide the result obtained above by two and then divide by the known efficiency.

Among the Contractors.

Mitchell Machine & Electric Company, Paducah, Ky., has been awarded the contract for the installation of a white way at Jackson, Tenn. The contract provides for 38 city blocks, four iron posts to the block. Work on this installation will be started soon.

H. A. Clark & Company, Chicago Heights, Ill., who have organized to devote themselves to house wiring, power installations, motor repairing and general electric contracting, have opened offices in that city at 1727 West End Avenue. The personnel of the new company indicates high-class work, efficiency and good service. H. A. Clark, senior member, has been inside construction foreman for the Public Service Company of Northern Illinois for eight years, and is a thorough electrician. Otto J. Harrett, the other member, has been in the Public Service Company's employ for three years and enjoys the reputation of being an expert workman in Crete, Ill.

Electrical and Power Appliances

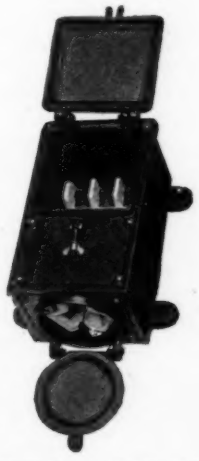
A Review of the Latest Developments and Information Respecting Electrical and Kindred Mechanical Appliances

A New Ralco Receptacle and Plug

The latest addition to the Ralco line of heavy-duty plugs and receptacles is known as the No. 22 and is designed for use on three-phase alternating-current or three-wire direct-current circuits, the plug being nonreversible. It is a three-pole weatherproof receptacle with fuse connection and has been meeting with an excellent demand from manufacturing plants using portable motor-driven machinery. Its capacity is 30 amperes on 250 volts.

This receptacle is regularly furnished with D & W inclosed fuse cutout set in place and wired to the receptacle. It can also be furnished, when specified, with plug-fuse block.

The body is of cast iron. A door at the top offers ready access to the fuses when necessary, but the entire front is removable for wiring. The receptacles are protected by the spring door which closes automatically as the plug is withdrawn. The hinged door

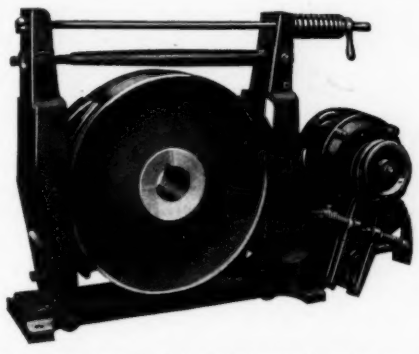


New Heavy-Duty Ralco Receptacle.

for the fuse and the spring door to the receptacle are gasketed. The receptacle body is designed for vertical mounting and is 8 by 12 inches in size, including mounting studs and projects 6 inches over all from the mounting surface. It is tapped for 1-inch conduit. This receptacle is manufactured and marketed by the Central Electric Company, Chicago, Ill.

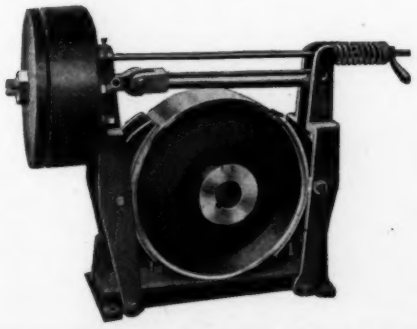
Two New Types of Cutler-Hammer Electric Brakes

Types RS and M are the terms designating a new alternating-current, motor-operated brake and a direct-current magnet-operated brake, respectively. The alternating-current brake with motor operation has been generally found to be more suitable than one depending on solenoid or magnet operation, because of the inherent characteristics of alternating-current solenoids being unsuitable for braking service. The motor-operated brake is silent in releasing, in applying and while held released. A high-torque squirrel-cage induction motor is employed. This is geared to a toothed sector which is linked to the arms carrying the brake shoes. When power is applied, the motor revolves until the brake is released. It then stalls and maintains the brake in the released position until power is cut off. One of the outstanding features to be noted is the ease of making adjustments of the brake for wear by means of simply turning a nut on the end of the thrust rod which is the upper rod shown in the accompanying illustration. This adjustment is required only two or three times during the life of the brake lining. These brakes are made in sizes ranging from 8 to 30 inches with ratings up to 250 horsepower.



Cutler-Hammer Type RS Motor-Operated Brake for Alternating-Current Service.

The direct-current magnet or solenoid brake shown in the second illustration is similarly constructed but has a magnet in place of a motor, the direct-current magnet being eminently suited for brake operation. There are six standard sizes, ranging from 8 to 27 with horsepower ratings like the motor-operated brake mentioned above. Brakes of this construction are particularly suited for severe service. Both these brakes are made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.



Cutler-Hammer Type M Magnet-Operated Brake for Direct-Current Service.

S. & C. PORTABLE HIGH-VOLTAGE SWITCH

Ingenious Switch of Very Simple Construction Gives Promise of Reliable and Inexpensive Solution of Many Switching Problems.

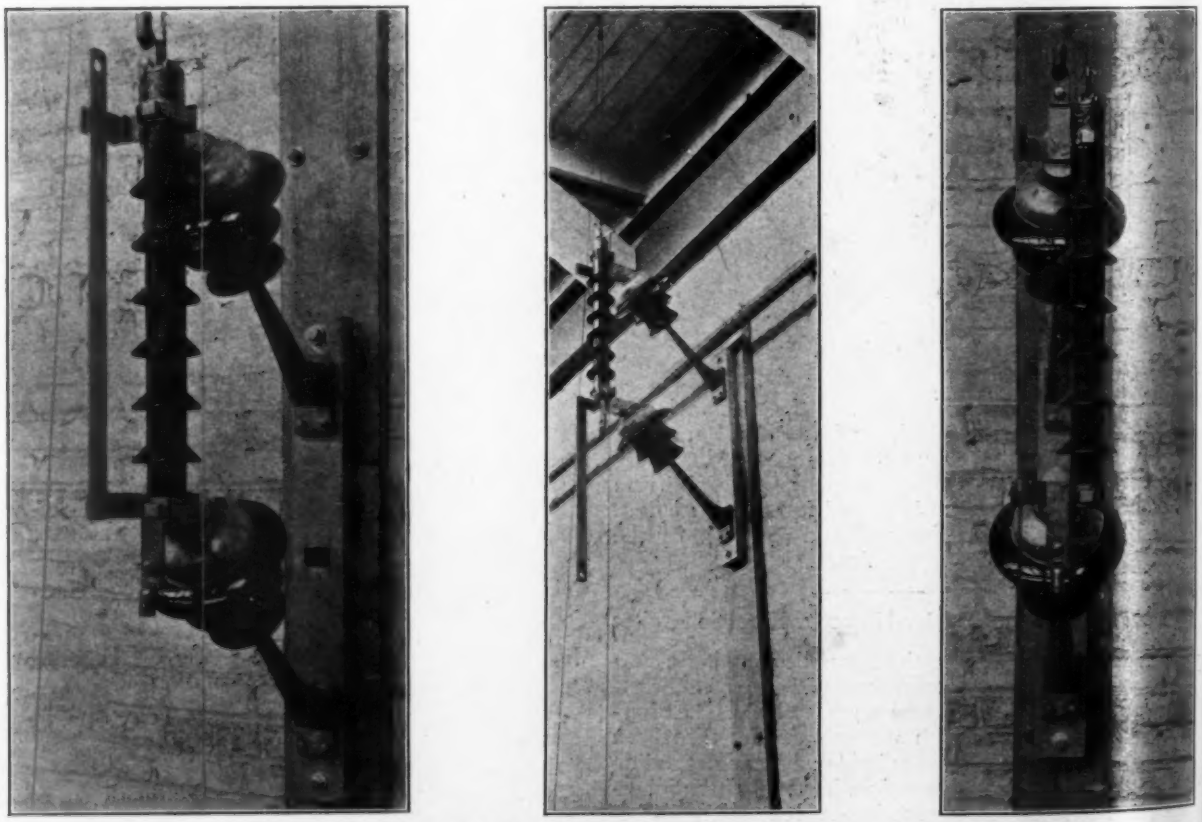
Both in generating stations and substations, whether the latter be of housed-in or outdoor types, the switching equipment represents a very large investment and takes up much valuable room. In a large proportion of these installations the switches are but infrequently operated, in fact in quite a few cases this occurs almost only at time of cleaning or inspection. In all such installations the provision of seldom-used but permanently installed switches seems as wasteful as would be the permanent mounting of a pair of pliers on every pole, so that a lineman who may have to climb it at an interval of many months, may find his pliers handy.

It would seem desirable therefore to substitute for the expensive permanently installed oil or air-break switch that is seldom used, a switch device that could readily be installed when the circuit must be broken under load. The development of just such a device has now been completed after a great deal of study. The primary aim was to produce a simple and inexpensive, but reliable, switch of portable type, that could quickly be placed into the circuit when the latter was to be opened. This object was more than met by the switch that was developed, for it was also readily adapted for permanent installation and for manual or automatic operation.

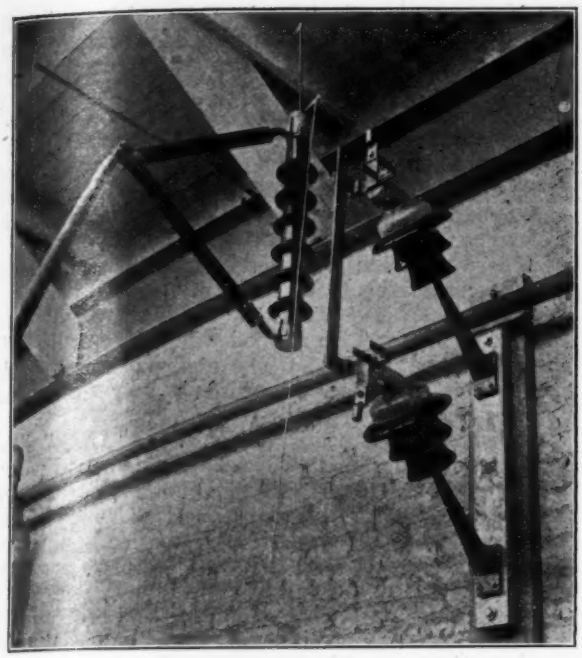
Extremely simple and ingenious is the design of the switch, as is shown in the accompanying illustrations. The new switch is a further development of the S. & C. automatic switching unit described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of May 12, 1917. It may be defined as a combination of disconnecting switch and very compact liquid-immersed switch. The former is almost invariably provided as a means of isolating any piece of apparatus or line and usually is a necessary auxiliary to an oil switch, or even a pole-top air-break switch. In the new S. & C. portable high-voltage switch the terminals of the disconnecting element are provided with a set of additional clips for inserting a portable element alongside the disconnecting switch. The illustrations show that by this simple construction the entire combination switch requires but little more room than an ordinary disconnecting switch alone.

The portable element is a light-weight insulating tube of length and diameter to correspond to the voltage and current to be interrupted. Its terminals are at the ends of the tube and are clasped directly by the contact clips referred to. Within the tube is an insulating liquid and a liquid director whereby the arc-extinguishing liquid is forced on the moving terminal in a most effective manner. To close this switch element a rod is pulled up from its top, which causes the internal contacts to engage. A catch at the side of the top holds the switch in closed position against the force of a strong spring in the lower portion of the tube. If this catch is tripped the internal contacts are disengaged and the spring pulls the lower contact down, the liquid rushing into the arc and very quickly rupturing it. Within the spring is a copper shunt of large carrying capacity, which is provided so that the spring does not have to carry any appreciable amount of current that might otherwise cause its temper to deteriorate. Repeated tests of this switch element have shown that the arc is broken in from 1 to 1½ cycles, which is a very much better performance than that of the most perfect oil switch.

It is obvious that the switch element can be opened

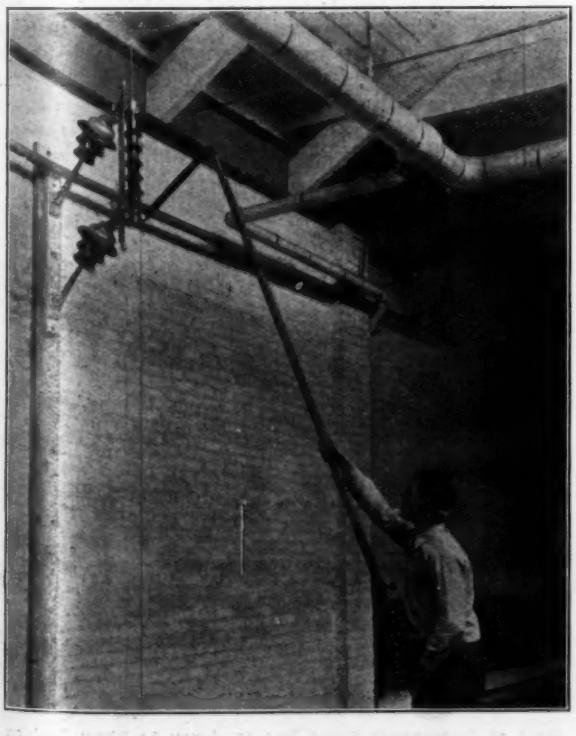


Three Views of S. & C. Portable High-Voltage Switch for 33,000 Volts, 100 Amperes. First View Shows Disconnecting Switch Closed, Other Views Show It Open.



Switch Pole Holding High-Voltage Portable Switch Element Ready for Insertion in Its Terminal Clips.

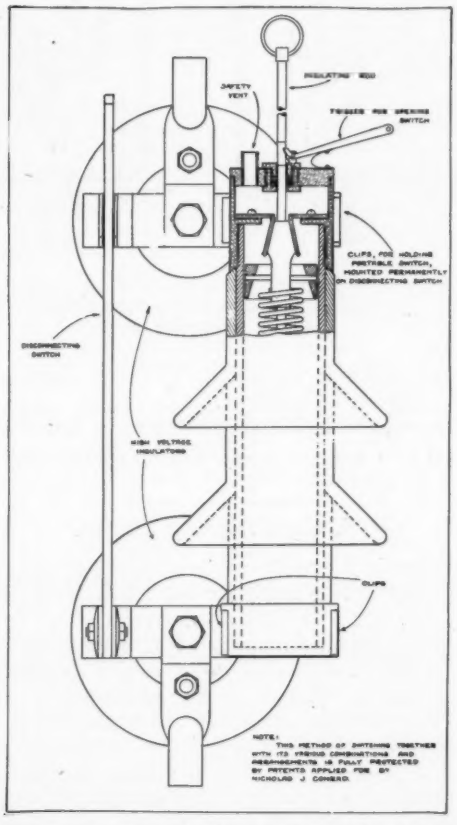
by a string or a rod, through releasing the catch, or the latter can be tripped by the means of a relay or the blowing of a fuse; the latter means make the device automatic, so that it will serve as a circuit-breaker to relieve a short circuit or heavy overload. Where the device is used as a portable switch, simple manual operation is used for closing. Where used as a permanently installed switch, similar operation can be provided by means of two strings, as shown. The string secured to the rod at the top is pulled upward over a pulley arrangement to close the switch, while the string



Inserting the S. & C. Switch Into Place.

secured to the catch is merely pulled down a little to trip the catch and open the switch. Where automatic operation is arranged for in an outdoor installation exposed to snow, ice or sleet, a simple wood shelter is put over the top of the device.

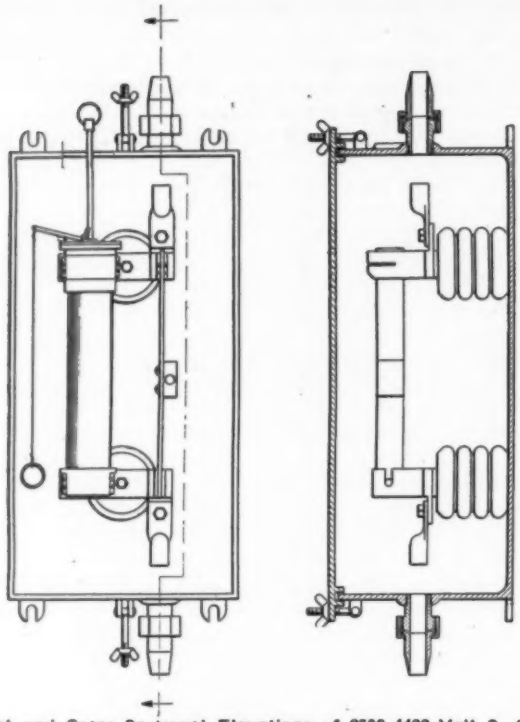
From the foregoing account and the accompanying illustrations it is evident that this portable switch can be easily placed alongside a disconnecting switch by means of a specially arranged switch pole. The latter has two hooks that engage loops on the front side of the element and it can thus be quickly pushed into its contact clips, or as readily removed bodily therefrom. Thus where relatively infrequent operation is required, as for instance for sectionalizing a line or feeder, or disconnecting an outdoor substation, linemen are merely provided with one of these portable



Cross Section of Upper Portion of 13,200-Volt, 100-Ampere S. & C. Portable Switch.

elements that they insert next to the disconnect to open the line under load. The same switch rod is used for opening the disconnect.

Many possibilities for using this new type of switch present themselves. From the fact that it can be made for such a wide range of voltages as 2300 to 110,000 it is evident that it is adapted to practically any high-voltage lines. It can be used indoors or outdoors, or in manholes, where underground construction is employed. A diagram of a manhole type or subway box with one of these portable switches is shown herewith. It is encased in a cast-iron box and occupies but very little room compared to what is required for a subway type oil switch. Thus in the restricted space of a manhole it presents important advantages that also apply where compactness in other installation is desirable. Similar disconnecting units are provided for pole-top installation on 2300 and higher voltage distributing systems. The low cost of the outfit is also an impor-



Front and Cross-Sectional Elevations of 2500-4400-Volt S. & C. Subway Switching Box.

tant feature and its simplicity and ruggedness are other inherent advantages.

These new high-voltage switches have been developed and are manufactured by Schweitzer & Conrad, Inc., 4431 Ravenswood Avenue, Chicago.

Unique Display Device.

Selfast is the trade name given to a very interesting display device made by the Herberts Engineering Company, Inc., 10 East 43rd street, New York City. It displays goods in motion where they are sold. It attracts by motion and color and is automatic. It consists of a cylinder with dome-shaped top on a suitable standard. Inside is an arrangement of magnets which revolve. The objects to be displayed, such as package goods, etc., are of course provided with an iron armature of some sort inside. When in operation, the displayed objects cling to the outer surface of the cylinder and travel and roll around it as the magnets revolve. It is capable of many variations and made a hit at the recent New York Electrical Show.

New "Minit" Electric Dishwasher.

An electric dishwasher of practical and at the same time scientifically correct design, and of sturdy construction, is announced by the Kitchen Service Company, Chicago. Everything in connection with this machine—the shape of the body, the size and arrangement of the propellers, the location of the basket containing the dishes, is the result of a series of experiments extending over a period of more than two years. The machine has been enthusiastically complimented by authorities both in the electrical field and in the realm of domestic science who have seen it in operation and studied its principles and construction.

Under the basket containing the dishes shown in adjacent illustration is a square shaft to which are attached the propellers or scoops. This shaft is connected directly to the motor by means of a spur gear insuring positive, direct and efficient drive. As the shaft is revolved at approximately 600 revolutions per minute, the hot water is thrown with great force upward and around the dishes in the basket. Every surface is cleansed and every trace of food particles, grease and accumulations of any kind removed. Breakage is practically impossible for the reason that the hot water comes in contact with all surfaces, inside and outside, at the same time and the expansion is fairly equalized.

There has been considerable agitation in recent months concerning the dangers of careless dishwashing and authorities agree that the only thoroughly safe method is the machine method where practically boiling water can be used. The announcement of this machine at this time, therefore, is very timely and its promise of profit to the trade very great.

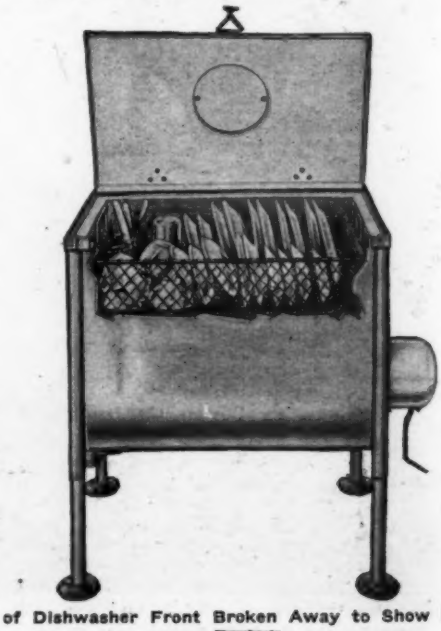
This new appliance is known as the "Minit" dishwashing machine. It is of decidedly rigid construction. The body is 24-gauge steel, all joints and corners are welded, the legs are standard one-inch wrought-iron pipes welded to the angle-iron frame work, the propellers are riveted to the shaft, and all parts are rustproofed.

The electric motor is contained in and protected by the housing which the illustrations show at the right, shielding it thoroughly from splashing, and also safeguarding the children.

The finish of the machine is baked-on white enamel, which with the nickel trimming results in a decidedly handsome machine in keeping with the finest kitchen equipment.

The Minit dishwashing machine is manufactured complete in the factory of the Kitchen Service Company, Chicago. The very best material possible is used and the men in charge are competent engineers and mechanics. The sheet metal is stamped out in one end of the shop and the material passes through the successive steps in manufacture until at the other end of the shop it undergoes the final rigid inspection and testing and is ready for shipping.

The new model of the Minit dishwasher has been designed with the idea of large production in mind. Indications are that here is a machine which fills the need long existing for a simple and thoroughly practical electric dishwashing machine.



Part of Dishwasher Front Broken Away to Show Position of Basket.

Activities in the Trade

Central Electric Company, 320-326 South Fifth Avenue, Chicago, has issued its Discount and Price Book, the matter in which applies to its general catalog No. 39.

Westinghouse Lamp Company's new plant at Trenton, N. J., has been completed, and machinery is now being installed. It is planned to have a capacity of 50,000 lamps daily.

The Ward Leonard Electric Company, Mount Vernon, N. Y., manufacturer of electric controlling devices and vitreous enamel insulation resistance units, announces that it is now represented in Pittsburgh, Pa., by Sperry & Bittner, First National Bank Building.

Hemming Manufacturing Company, Garfield, N. J., is now and hereafter to be known as the Garfield Manufacturing Company, the change in name recently having been made. This company's product comprises Gummon, Tegit and Hemit heat-resisting molded insulations.

Guarantee Electric Products Company, 47 West 42d Street, New York City, calls attention to a number of electrical specialties for which it acts as distributor. Those specialties comprise electric radiator heaters, electric glue pots, percolators, toasters and other utilities.

Chicago Mica Company, Valparaiso, Ind., has found it necessary to double the capacity of its plant, by installing much new machinery. This enables the company to meet the greatly increased demand for "Micabond" insulation from the users of mica throughout the United States.

General Electric Company, Newark, N. J., has awarded a contract for the construction of a new four-story addition to its plant in Boyd Street. The structure will cost about $14,000. Salmond Brothers Company, 526 Elm Street, Arlington, N. J., has the contract for erection.

Ward Leonard Electric Company, of Mount Vernon, N. Y., manufacturer of electric controlling devices and vitreous enamel insulation resistance units, announces that it is now represented in Detroit, Mich., by the Electrical Specialties Company, 69 State Street.

Spray Engineering Company, 93 Federal Street, Boston, Mass., has issued literature describing the Spraco pneumatic painting equipment. It consists of a portable outfit for either shop or field use. The pneumatic gun is connected by flexible hose to a combination container and pressure control head.

The Interstate Light & Power Company will supply the electric energy requirements, amounting to 45 horsepower in motors, of the National Roasting Plant's new machine shop at Cuba City. The company will also supply energy amounting to five horsepower for the ventilating system of the High School at Benton.

Link-Belt Company, Philadelphia and Chicago, presents a 64-page catalog in which the Link-Belt automatic wagon and truck loader is illustrated in an effective manner. The machine is motor-operated, has great capacity, and is specially adapted to loading coal, sand and gravel for wagon and truck haulage.

Post-Glover Electric Company, Cincinnati, O., whose plant on West Fourth Street was recently destroyed by fire, as noted in our issue of October 13, has leased the property of the William Mayer Company, on West Third Street near Rose, where it will actively resume its extensive electrical supply business.

The Southwest General Electric Company, with offices at Dallas, Houston, San Antonio, El Paso, Texas, and Oklahoma City and Tulsa, Okla., has recently become agent in that territory for the Consolidated Utilities Corporation, of Chicago, to handle the Matthews electric light and power plants, which are automatic, self-starting, self-stopping and self-contained, built in 1, 2 and 5-kilowatt capacity.

Davis Slate & Manufacturing Company, Chicago, which claims to be the largest producer of electrical slate, is maintaining its reputation by constantly enlarging its list of satisfied customers. The Company's recent addition to its plant is already overtaxed and additional enlargements will soon be necessary.

General Fire Extinguisher Company, Providence, R. I., presents a special bulletin for October devoted to the application of its Grinnell automatic sprinkler system to the printing industry, giving facts to show the radical reduction of fire-insurance rates as the result. Data on this subject are compiled concerning 67 printing and lithographing plants.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., presents in leaflet No. 3987, just published, some facts and illustrations by which the Westinghouse underfeed stoker is explained. Such features as the air-distributing box, fuel trough, coal extension plate, tuyeres and moving grate are shown in the illustrations. These stokers are going into some of the largest power plants now under construction.

Northwestern Electrical Equipment Company, St. Paul, Minn., has established a branch in Duluth, Minn., where a large warehouse and a division sales office will be maintained. The new branch is designed to serve the company's trade in nine counties of Minnesota and three counties of Wisconsin. A. M. Baldwin, Jr., takes charge of the Duluth branch as district manager. Much trade of that section is among the metal mines.

Coil-Winding Machines Attract Show Visitors.—In the factory of the Electric Cable Company, New York, there are probably a thousand coil-winding machines, each capable of braiding 3000 feet of rubber-covered wire a day. The company wished to put a little human interest into its exhibit at the New York Electrical Show this year, so installed one of these machines in the booth, where it operated day and night, to the never-ending interest of the throng.

Appleton Electric Company, Chicago, manufacturer of "Unilets" and other conduit fittings, has secured the services of V. L. Crawford, widely known to the trade as "Happy" Crawford, as district sales agent. Mr. Crawford, for many years, was with W. N. Matthews & Brother, but during the last three years has been with Hubbard & Company, Pittsburgh. He is one of the best known salesmen in the electrical field and has a host of friends whose best wishes he has.

Indiana Rubber & Insulated Wire Company, of Jonesboro, Ind., with a branch office at 210 South Desplaines Street, Chicago, gives information, illustrations and prices of its Paranite rubber-covered wires and cables in its 1917 bulletin. The 112 pages of matter between the covers is in loose-leaf form, held in place by brass fasteners. The order and arrangement are such as best to serve the customer. An index in the front part serves to find quickly the information desired. Price quotations have special reference to dimensions and other features of wires and cables.

E. P. Blake, of the **American Pipe Bending Machine Company,** Boston, Mass., has in his "Wonder" pipe bender something of greater possibilities than even he was aware. He knew there was a field among electrical contractors and others in this industry but, due to pressure in other fields, never had given the attention to it that he felt it deserved. A representative of the ELECTRICAL REVIEW brought up the New York Electrical Show in a recent talk and Mr. Blake quickly saw the opportunity. By some work on the wire he succeeded in getting an exhibit space at the last minute and the move turned out to be very profitable, for the "Wonder" bender "took" in a minute with the electrical men. Mr. Blake states he has lined up and signed for at least $30,000 worth of business directly traceable to the Show.

Cutler-Hammer Manufacturing Company, Milwaukee, Wis., gives in one of its recent bulletins some excellent illustrations, showing installations of its magnetic separators for picking up various magnetic substances, to prevent their passing with the products through machines. In this way the machines are protected.

Standard Optical Company, Geneva, N. Y., is the manufacturer of Stoco safety goggles. It sends out a booklet in which the story of the use and utility of the safety goggle is told by illustrations and printed language. The company manufactures the lenses used in the Stoco goggle. Its service in protecting the eyes of riveters, chippers, stone workers, and those operating turning, grinding and drilling machines, is well presented.

Westinghouse Electric & Manufacturing Company's 12-page bulletin, entitled "Westinghouse Railway Engineering Data," is issued monthly. The October number is devoted to Railway Motor Fundamentals, and gives concise descriptions of electric traction equipment and operations. As a piece of current literature produced from contact with modern practice, this bulletin cannot fail to be of real interest and service to the electrical engineer concerned in electric railways.

The Manhattan Electrical Supply Company, New York and Chicago, is showing this year a new type of electric sewing-machine foot control. This gives four motor speeds, with varying pressures of the foot, and embodies an automatic brake which immediately stops the machine when the foot is lifted. "Don't forget Red Seal batteries" was the parting admonition of Ormond Wright, Jr., as we left the booth of the New York Electrical Show where the sewing-machine motor was exhibited.

The Argus Lamp & Appliance Company, 322 Euclid Avenue, Cleveland, O., is now actively placing on the market the Oscar Sheck Universal projector lamp appliances for the adaptation of all makes of carbon-arc picture-projection machines to the new types of Mazda lamps, which have been developed for this work. This adapter can be added to any arc projector by means of four bolts and without interrupting the program. This equipment was described in the ELECTRICAL REVIEW of August 18, 1917.

The General Vehicle Company, Brooklyn, N. Y., in addition to its 3½-ton electric truck, exhibited its 9-cylinder aeroplane motor at the New York Electrical Show. The cylinders of this motor are machined from a solid billet of special steel weighing 82 pounds. This is turned down and bored out until the final weight is only 5½ pounds, and the walls only one-sixteenth of an inch thick. The motor has a total weight of only 272 pounds, yet develops 100 horsepower at 1250 revolutions per minute.

The Majestic Electrical Development Company, San Francisco and Philadelphia, had a lot of its new radiant heaters on exhibition at the New York Electrical Show. These are built with a projector having much the appearance of a searchlight, the inner surface being of polished copper. Mounted at the proper point within this reflector is a small resistance coil, not over 3 inches in length by one inch in diameter. Despite the small size of the units, they give out a very comfortable heat and pleasant glow.

Crouse-Hinds Company, Syracuse, N. Y., has issued bulletin No. 1D, dealing with safety panels and cabinets. The distinctive feature of these cabinets is that they have a separate door for the switches, which are of the push-button type. A larger door gives access to the circuit fuses and also to the panel and feeder fuses and main switch, if such are provided. Several types of steel and wood trim are provided. The details of the construction are fully illustrated and described in the bulletin; also full data are given of the various types and sizes of panels and cabinets made. A copy of this bulletin will be sent to anyone on request to the company.

Industrial Electric Furnace Company, 53 West Jackson Boulevard, Chicago, has issued bulletin No. 40 on electric furnaces of the Snyder system. Electric steel is discussed in connection with these furnaces and the advantages of producing steel in this manner are carefully set forth. Several pages are devoted to a discussion of the economy of operation of electric furnaces; also their simplicity and certainty of operation. The field of the small electric furnace is also taken up. Numerous data are given, as well as a large number of views of typical installations where Snyder furnaces have been installed and are in successful operation.

The "Quarter Century Club" of the General Electric Company, composed of employees who have been with the Company twenty-five years, or more, has donated $1750 as a "comfort fund" for the old Second, now the 105th New York Regiment, of Schenectady and neighboring cities. This sum will form the nucleus of a fund to be placed in the hands of Col. J. W. Andrews, for the aid and comfort of the soldiers from this vicinity. A large percentage of these men are employees of the General Electric Company. At a meeting held October 17 the members devoted the evening to the Second Liberty Loan, listening to addresses by President A. L. Rohrer and G. E. Emmons.

Federal Sign System (Electric), Chicago and New York, has sent out letters to the general managers of central stations and others interested in electric signs a communication relative to the proposed cutting off of such signs, if emergency requires a decrease of load in order to save coal. The following is extracted from this letter:

"There has been some agitation as to the matter of turning off electric signs in the movement to conserve coal. The amount of coal that can be saved by this method is so insignificant and the consequences of such a move appear upon consideration to be so serious and so unfair to a certain very large class of merchants, that we feel that it cannot have been thoroughly considered by those who are agitating it. If the entire idea is to save coal, many times the same amount could be saved in other ways. . . . If, on the other hand, the electric sign is selected to be cut off because it is advertising, and as such is considered unnecessary, the action should be extended in the same degree to other forms of advertising. . . . The electric sign is practically the only advertising medium for the small merchant, as his business is generally not such as to warrant the use of newspaper space, because it is so expensive that his business would not stand the cost of the amount of newspaper publicity that would be necessary to give him the same effect that he gets from an electric sign, or because in many cases a large portion of the circulation would be wasted circulation. It would be a great injustice to this class of people to turn out the electric signs. We are not in favor of stopping any form of advertising as we feel that advertising is necessary to the continued prosperity of the business of the country, but we also feel that if the Government deems it desirable to curtail advertising, that various forms of advertising should be curtailed uniformly.

"One of the reasons that probably presents itself to the persons advocating discontinuing the use of electric signs is the psychological effect that this would have upon coal users, bringing forcibly to their attention the necessity of retrenchment in coal consumption. This in itself is a striking testimonial to the value of electric advertising and we believe that those who advocate the shutting off of signs have overlooked another psychological effect that would very much counterbalance any gain that there might be in effecting a reduction in coal consumption. This counter effect is the feeling of depression and the tendency to hold back and cut down wherever possible that would be instilled in the minds of the general public by any such action.

"High officials of the Government have given as their opinion that the people should not institute a general practice of rigid retrenchment in the matter of expenditures, but that they should be economical in the matter of food and other articles in which there is a scarcity and otherwise go along in the ordinary way that they have been accustomed to, to the end that the business of the country should continue to be prosperous and thus be able to bear its share of the burden of the war. It seems to us that indiscriminate turning out of electric signs would tend immediately to cause an opposite effect.

"If it should be decided that it is proper to curtail electric signs, it seems to us that the fairest place to make retrenchment would be by applying it to the large roof signs on rented spaces, as a business so advertised can generally use other forms of publicity to advantage, hence turning out such signs during the coal-shortage period, say November 15 to February 15, would not be so great a hardship.

"There is no question as to the loyalty of sign manufacturers or central-station companies, and every one of them would be willing to have any steps taken that the Government deems necessary to win the war, regardless of the effect upon their own business. At the same time we feel that in justice to this attitude, no steps should be taken or no agitation set in motion which would injure their business without serious consideration being given the matter, and its being shown that the measures taken are necessary and do not discriminate unfairly against this particular industry."

Personal and Biographical

M. S. ORRICK, San Francisco, Cal., has been appointed assistant manager of the Western Electric Company, in charge of business in the San Francisco district.

LLOYD P. JONES, formerly sales manager for Federal Brass Works, Detroit, Mich., recently was appointed vice-president and general manager of that company.

BOYD E. HANNON has resigned as manager of Sacramento division of Great Western Power Company to enlist in Signal Reserve Corps of the U. S. Army.

A. S. LINDSTROM is now general manager of the Thordarson Electric Manufacturing Company, Chicago. He formerly was connected with Western Electric Company.

L. O. VASSER, formerly electrical superintendent for Aluminum Company of America, is now on the engineering staff of the Electric Bond & Share Company, New York City.

F. L. CONVERSE, connected with the Midvale Steel Works, Coatesville, Pa., as electrical engineer, has resigned, to become associated with the Tacony Ordnance Company, Philadelphia.

J. J. MOLYNEAUX, auditor for the Byllesby interests in the Southwest, has been appointed acting treasurer of the Minneapolis General Electric Company during the temporary absence of H. R. Frost.

RAYMOND W. WALES, formerly manager of the appliance department of Waterloo Electric Supply Company, Waterloo, Ia., has enlisted in the Aviation Corps.

ROME WIRE COMPANY, Rome, N. Y., advises that 47 young men in its employ have joined the Colors. Of this number, 28 are in the Regular Army, 10 in the Navy and 9 in National Army.

B. O. LUND, manager of the Stillwater, Minn., division of the Northern States Power Company, was appointed one of the three directors in charge of the local Second Liberty Loan campaign.

ARTHUR WILLIAMS, general inspector of the New York Edison Company, New York City, has been appointed Chairman of the Food Administration Conservation Campaign Committee of New York City.

H. E. YOUNG, sales manager of the Minneapolis General Electric Company, has been appointed chairman of the Liberty Loan Committee in charge of the county districts in the neighborhood of Glencoe and Hutchinson.

BELDEN MANUFACTURING COMPANY, Chicago, has a number of employees in national service. The following men are mentioned, who were on the company's office and engineering staffs: C. S. Craigmile, engineer, is second lieutenant in 331st Field Artillery, Camp Grant; A. F. Wanner, engineer, sergeant, at Camp Grant; R. V. Waller, sergeant in Aviation Section, is now on duty in France.

M. L. HIBBARD, manager of the Union Light, Heat & Power Company, Fargo, N. D., has been appointed acting president of the local Rotary Club.

MORGAN T. COAKLEY of the Robertson Cataract Electric Company, Buffalo, N. Y., is a lieutenant in the Engineers' Section, Officers' Reserve Corps.

W. H. BROWN, manager of the Red River Power Company, Grand Forks, N. D., acted as captain of one of the teams soliciting subscriptions to the Second Liberty Loan.

J. F. MCGUIRE, manager of the Minot, N. D., division of the Northern States Power Company, has been elected member of the board of directors of the Association of Commerce.

J. E. HARSH has been appointed general manager of Lincoln (Neb.) Gas & Electric Company, having formerly held a similar position with the Salina (Kans.) Light, Power & Gas Company.

GEORGE H. WILMARTH, manager of the Sapulpa Electric Company, Sapulpa, Okla., took an active part in the sale of the Second Liberty Loan, having been appointed captain in the district which includes Sapulpa.

O. H. SIMONDS is now general manager of Dubuque (Ia.) Electric Company, having formerly been general manager for the Vicksburg (Miss.) Light & Traction Company. Both these are properties of Elston & Company, Chicago.

DEAN R. C. YEOMAN of Valparaiso University, who was chief inspector of concrete roads in Ontario, Canada, for the Portland Cement Association the past summer, has returned to take charge of the engineering department of Valparaiso.

CLOYD HUNT, who has been associated with the Minneapolis General Electric Company for several years, has been appointed manager of the newly created Southwestern Division of the Northern States Power Company, with headquarters at Montevideo, Minn.

NORMAN F. OBRIGHT, formerly associate editor of the WESTERN ELECTRICIAN and for a number of years sales engineer for the Sanitary District of Chicago and later for the Commonwealth Edison Company, Chicago, was married to Miss Jeannette M. Bauer on October 20.

JOHN R. MONAGHAN, connected with the engineering department of the Public Service Commission, New York City, for the last ten years, has resigned to become associated with the Rapid Transit Subway Construction Company, New York, in the capacity of engineer for subway construction.

HENRY J. HORNUNG, formerly in the electrical jobbing business, and more recently connected with Fullerton Electric Company, New York, is now secretary of the H. Russell Brand Business Laboratories, and manager of the New York office of Appliance & Supply Company, with offices in Woolworth Building.

M. S. SLOAN, recently appointed vice-president and general manager of New Orleans Railway & Light Company, is a graduate of Alabama Polytechnic Institute. He spent some time in earlier days with General Electric Company, and in 1906 was appointed chief engineer for Birmingham Railway, Light & Power Company. He came to the New Orleans company in 1913.

HENRY M. BYLLESBY, president of H. M. Byllesby & Company, Chicago, is the author of a stirring, vigorous article which appeared in the November number of *The Bankers' Monthly*. The article bristles with outstanding facts as to "Why America is at War," and scintillates with patriotic appeals for a united support of our Government in the war against Germany's autocratic domination. Mr. Byllesby presided over the public meeting held at the Auditorium Theater, Chicago, October 14, which was addressed by Dr. Newell Dwight Hillis of New York.

ANGUS S. HIBBARD, one of the best known telephone men in the Central West and a leader in community work in Chicago and other places where he has resided, is the author of a patriotic poem appearing in a recent issue of the Chicago Herald. Mr. Hibbard's verses and songs always have timely interest and strong personal appeal, as is shown in the following lines on Liberty Bonds:

BUY A BOND.

Go, buy a bond and back the boys
Who go to France for you.
Buy it today; make no delay.
They take this chance for you.
Shall you live on and pay no price,
Accepting this great sacrifice?
Have you a craven coward's heart?
Do you refuse to do your part?
No?
Help, then, your country make men free.
Go, buy these bonds of liberty.
Go!

Obituary.

WILLIAM BARCKLEY SNYDER, an electrician in the employ of Duquesne Light Company, Pittsburgh, Pa., met death by contact with an 11,000-volt live wire on October 1. He had been married only four weeks previous to his death.

DR. EUGENE FRANZ ROEBER died October 17 after a long illness. He was associated with Dr. Carl Hering, at Philadelphia, in electric engineering work a few years following 1894. On the founding of "Electrochemical Industry," in 1902, he became its editor, and later was one of founders of the American Electrochemical Society, of which he was president in 1913-14. He was a member of the American Institute of Mining Engineers, American Institute of Electrical Engineers, and American Chemical Society. For many years he contributed articles to the technical press on electrical subjects. Dr. Roeber was born in Germany October 6, 1867, coming to the United States in 1894.

Men in Government Service

Items of Interest Concerning Power and Electrical Men Who Have Joined the Colors

CHARLES B. HOLMES has recently been commissioned first lieutenant in the Engineering Officers' Reserve Corps. Mr. Holmes is employed by the Utilities Development Corporation, 327 So. LaSalle street, Chicago, and is at present engineer and assistant superintendent on power plant construction at Edwardsport, Ind.

OTTO SANAKER, who had charge of credits for the Minneapolis General Electric Company, is now a first sergeant in the company of which he is a member, now in training at Camp Dodge, Des Moines, Ia. Other employees of the credit department of this company in service are: J. E. Davis, L. A. Stowell, Jesse Raudenbush, A. L. Bliss, H. L. Pantel, John J. Davis and S. L. Hagen.

J. E. THOMPSON, son of A. J. Thompson, president of The Thompson Electric Company, Cleveland, Ohio, enlisted in the Ohio Engineers' Corps, in January, 1917, about six months before the mobilization call was made. He was gradually advanced, now having a commission as captain, at Camp Sheridan, Ala. He went home October 6 to be married, returning immediately with his bride, who will remain with him until he leaves for Europe.

THE OKONITE COMPANY, Passaic, N. J., reports eleven of its employes in military and naval service, as follows: At Camp McClellan, Anniston, Ala.: Luther C. Clock, corporal, and Clarence Brett, private; at Camp Dix, Wrightstown, N. J.: Geo. D. Conover, John Luckjiff, John Onufery, Michael Gaydos, privates; Camp Upton, Yaphank, L. I.: William H. Hainkis, electrician; Ft. Slocum, N. Y.: William H. Davis, private; Navy: Fred Schlingloff, second class yeoman, now in French waters; John Bergan and John Baker, first-class seamen. Others, who have been drafted, have not been called out.

ELECTRICAL TESTING LABORATORIES, New York City, had 55 men in its employ at the main office on June 1, and of this number 15 have since entered army and naval service, as follows: J. H. Kirtland, captain Quartermasters' Department, Charleston, S. C.; M. Dupraz, 165th Regiment, "Rainbow Division," Camp Mills, L. I.; D. F. Ritchie, Naval Militia, stationed on Battleship Missouri; C. Lawson, Squadron A Cavalry, Spartanburg, S. C.; J. Hyde, United States Marine Corps, Philadelphia Navy Yard; Carl Eckerman, Naval Reserve, serving on Coast Defense Fleet; J. Wright, Naval Militia; M. G. Woolfson, National Army, Yaphank, New York; F. A. Boykin, corporal, National Army, Yaphank, New York; J. F. Dick, Aviation Dept., Signal Corps, Cornell University; L. E. Baker, left employ to join the Navy; A. A. Munvies, Signal Corps, Cornell University; E. Peterson, enlisted in Signal Corps; O. C. Cordes, electrical draftsman, Navy Dept., Bridgeport, Conn.; J. Hysko, electrical test dept., Brooklyn, Navy Yard.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

THE ELECTRICAL REVIEW will *welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

MINNEAPOLIS GENERAL ELECTRIC COMPANY, Minneapolis, publishes *The Advance*, a little newspaper devoted mainly to the activities of its employees. The October number gives the names of 56 young men who have gone from the central-station ranks of the company to the numerous departments of military and naval service. This list is carried along, appropriately, as a roll of honor.

KUHLMAN ELECTRIC COMPANY, Bay City, Mich., had several young men in its employ who responded to the nation's call for military service. William McGibbon and Merton Phillips were among those who enlisted early; Charles Lukowski is an infantryman in the regular army; Frank E. Johnson, son of J. A. Johnson, secretary-treasurer of Kuhlman Company, is a member of Michigan Ambulance Company No. 2, now in training at Waco, Texas.

NATIONAL LAMP WORKS publishes a Roll of Honor, giving the names of nearly 100 employees now in service of the Government, on land and sea and in the air. Among those so engaged is Miss Emily Colquhoun, a Red Cross nurse.

THE SIXTH TELEGRAPH BATTALION, United States Reserve Signal Corps, made up of 200 men from the central group of Bell telephone organizations, is now in military service, after a short time spent in training at Fort Leavenworth, Kans. One company of this battalion is composed of Chicago Telephone Company volunteers. Later the Eleventh Battalion, of Bell telephone boys, was organized. Company E of this battalion is made up mostly of Chicago Telephone Company employes; Company D is composed of 46 men of the Michigan State Telephone Company, 46 of Cleveland Telephone Company men, 2 from Wisconsin Telephone Company and 2 of the Chicago Telephone Company. Captain Virgil E. Code, of Chicago, commands Company E, and Captain William C. Elmore, of Milwaukee, commands Company D.

THE DUQUESNE LIGHT COMPANY SECTION of National Electric Light Association publishes at Pittsburgh, Pa., the *Light Company News*, which carries, as a roll of honor, the names of 118 young men of the company's force now in the numerous departments of Federal service. Every department of the military and naval service is represented by them. This organization, through the *News*, keeps advised of the movements, changes and other information concerning its members enrolled in national defense.

RESPONSE BY CENTURY MEN.

CENTURY ELECTRIC COMPANY, St. Louis, Mo., is represented in the Army and Navy by 75 of its employees. In Regular Army are:

V. Rather	C. Straube
Albert Partack	E. Krankle
Gus Bergner	Edw. Adolf
Chas. Botts	Henry Knutson
J. Hammel	E. Jasper
F. Glover	F. Wilkinson
R. Wooster	V. Dahl
J. Whalen	Leon Slavick
	T. Tisinger

In Navy:

Rufus Lee	J. Huddleston
James Howze	G. Brown
E. Copeland	C. Sanders
J. Carroll	Leon O'Brien
Geo. Gerhardt	A. D. Dahl
G. Y. Watt	J. Shelte
	Chas. Atherton

Marines:

E. A. Thompson	Joe Yeager
M. E. Chapman	H. Moore
E. S. Moore	Wm. Kleissle
John Bock	Wm. Bush
	S. P. Tracy

Missouri National Guards:

L. H. Straube	Harley Strachan
Ed Warren	L. Huddleston
Arthur Heberer	G. Thompson
E. Rombach	John Evans
Tom Leamy	O. Franke

Illinois National Guards: Leonard Ross and H. C. Holman. Red Cross: Harold Gilbert and A. Cauffield. Aviation Corps: Andrew Bartlett. Naval Reserves: William Ready and L. Shea. Officers' Reserve: C. P. Seeger, E. Schlicker, A. L. Booth, A. E. Hartung, H. L. Haverstick. Aero Supply Squadron: Cleo C. Hoover. In National Army by select draft: D. Wall, S. Stackle, E. Stackle, J. Krausert, Ed. Heede, G. Russell, Robt. Wolff, Siliro Piarrani, R. Brighton, Oscar Door, E. Beckman.

Current Electrical News

WEEKLY RECORD OF CONSTRUCTION ACTIVITIES

EASTERN STATES.

CLAREMONT, N. H.—Claremont Power Company is planning to double its load at the substation of the Monadnock Mills by the installation of additional transformer capacity, and has increased the size of the transmission line to this station. The company is also building a substation at Claremont to increase the capacity by 2000 kilowatts.

MANCHESTER, N. H.—Manchester Traction, Light & Power Company has awarded a contract for the construction of a power station at its plant.

WEST SPRINGFIELD, MASS.—Gilbert & Barker Company have awarded a contract for the construction of an addition, about 57x93 feet, at its power plant. The H. Wales Lines Company, 134 State street, Meriden, Conn., has the contract for erection.

BINGHAMTON, N. Y.—Binghamton Light, Heat & Power Company has signed contracts during September for furnishing power to the amount of 445 horsepower. The company has also secured an extension to its street-lighting contract for one year, effective Jan. 1, 1918.

BROOKLYN, N. Y.—United States Government, Bureau of Yards and Docks, has awarded a contract for the construction of a power house at the local navy yards, at a cost of $18,186. The Whitney Company, 101 Park avenue, has the contract for erection.

BUFFALO, N. Y.—Curtiss Aeroplane Company is planning for the erection of a power plant at its Elmwood works to cost about $10,000.

BUFFALO, N. Y.—Kellogg Products Company is having plans prepared for the construction of a one-story brick power house to be erected in Stephenson street, Niagara Falls.

BUFFALO, N. Y.—New York Central and Hudson Railroad Company will erect a power house at 143 Curtiss street, to cost $30,000, and a signal tower to cost $5500. Address F. B. Wiegand, Signal Engineer, Cleveland, O.

NEW YORK, N. Y.—Cosmopolitan Gas & Electric Supply Company has incorporated with a capital of $10,000, to manufacture gas and electrical supplies. Incorporators are D. and S. Swartz, and W. Shlessinger, 280 Bowery.

NEW YORK, N. Y.—New York Edison Company, 130 East Fifteenth street, has had plans prepared for the erection of an addition, about 25x85 feet, to its power house at 666 First avenue. The structure is estimated to cost about $7000. George F. Kiess, 130 East Fifteenth street, is the architect.

NEW YORK, N. Y.—New York Telephone Company, 15 Dey street, is having plans prepared for the erection of a five-story brick exchange plant, about 75x100 feet, at 227 East Thirtieth street, to cost about $500,000. McKenzie, Voorhees & Gmelin, 1123 Broadway, are the architects.

NEW YORK, N. Y.—Public Service Commission has handed down an order requiring the Interborough Rapid Transit Company, 165 Broadway, to maintain a coal reserve of at least 4000 tons in the bunkers at its power house at Seventy-fourth street and the East River. Power for the operation of its elevated lines is generated at this plant, and the order was made to prevent any shutdown of the elevated system due to coal shortage.

NEW YORK, N. Y.—Long Island Lighting Company has filed petition asking authority to issue $100,000 in common capital stock, the proceeds to be used to provide additional working capital. Address E. L. Phillips, 50 Church street, Room 1665.

NEW YORK, N. Y.—Consolidated Power Company, a newly incorporated subsidiary of the Consolidated Gas, Electric Light & Power Company of Baltimore, will build the proposed $5,000,000 electric generating plant on the large waterfront tract recently acquired at Dundalk. Plant is expected to be completed in 18 months with a capacity of 45,000 kilowatts.

NIAGARA FALLS, N. Y.—Niagara Falls Gas & Electric Light Company is planning for the construction of a large new gas plant and the extension of its mains throughout the city to provide for increased capacity.

ROME, N. Y.—Rome Electrical Company has filed notice of an increase in its capitalization from $40,000 to $300,000 for expansion.

SCHENECTADY, N. Y.—American General Electric Edison Corporation of China has filed notice of an increase in its capitalization from $250,000 to $500,000 for expansion.

STAPLETON, S. I., N. Y.—New York & Richmond Gas Company has made application to the Public Service Commission for permission to issue bonds for $2,214,400 for improvements, etc.

TROY, N. Y.—Troy Gas Company has increased its capital from $3,000,000 to $5,000,0000 for expansion.

UTICA, N. Y.—Mutual Box Company has awarded a contract for the construction of an addition to its power house in Erie street to cost about $5000. The John F. Hughes Construction Company, 211 Post street, Utica, has the contract for erection.

ATLANTIC CITY, N. J.—Board of Public Utility Commissioners has granted permission to the Atlantic City Electric Company to issue bonds to the amount of $58,000 for improvements.

ATLANTIC CITY, N. J.—Haddon Hall Hotel is having plans prepared for the erection of a one-story brick and concrete power house. Addison H. Savery, Atlantic City, is the architect.

CAMDEN, N. J.—City Council has approved plans for the erection of telephone poles in Twenty-ninth street and Van Buren street, together with submarine cable and landing to provide telephone service to Petty Island.

DOVER, N. J.—New Jersey Power & Light Company has secured a contract from the Wharton Steel Company for supplying power to its mines to the amount of 4300 horsepower, which totals 5800 horsepower contracted for within the past month. These contracts will provide service for the operation of three of the mines of the Wharton company, the Oreland Mine, 3000 horsepower; the Scrub Oak mine, 2000 horsepower; and the Andover Shaft, 800 horsepower, one of which has already been connected up. The company expects to complete connections within three months at a cost of about $8000.

GIBBSTOWN, N. J.—Township Committee, along with several other towns in the county, has entered into a contract with the electric lighting company for the furnishing of current for this town.

GLOUCESTER CITY, N. J.—Ordinance granting Delaware & Atlantic Telegraph & Telephone Company a 50-year franchise for erecting its telephone poles and laying down its conduits, which has been before city council, was passed.

HIGHTSTOWN, N. J.—Board of Public Utility Commissioners has granted permission to the Electric Light & Power Company to issue bonds to the amount of $36,000 for improvements.

IRVINGTON, N. J.—Irvington Manufacturing Company has awarded a contract for the construction of an addition to its power plant, about 20x45 feet, to cost approximately $3,000. Henry M. Doremus Company, 36 Orange street, Newark, is the contractor.

NEWARK, N. J.—Board of Freeholders is planning for the immediate installation of electrical equipment in the laundry addition at the Essex County Hospital at Overbrook, and will call for bids soon.

NEWARK, N. J.—Titan Storage Battery Company, 4 Lister avenue, has taken out a building permit for the construction of a one-story power house, about 50x70 feet, to cost about $4100.

NEWTON, N. J.—Sussex Print Works, 33 Liberty street, has awarded a contract for the construction of its proposed one-story brick power house, about 50x50 feet, on Sparta avenue, to cost $7000. The William L. Platt Construction Company, United Bank building, Paterson, is the contractor.

PERTH AMBOY, N. J.—American Smelting & Refining Company, 120 Broadway, New York, has had plans prepared for the construction of a one-story power house addition, about 60x70 feet, to its local plant.

TRENTON, N. J.—City Commission plans the immediate installation of an electric lighting system in Mahlon Stacy Park, between Calhoun street and the Log Basin. Leon D. Hirsch, City Clerk.

TRENTON, N. J.—Luzerne Rubber Company has awarded a contract for the construction of a one-story brick and steel power house, about 40x50 feet, to cost about $5000. Newton K. Bugbee, Trenton, has the contract for erection.

TRENTON, N. J.—Turbo Motor Com-

Business is Good

Our business has been very good indeed this past year, but largely on account of maintenance work. We anticipate possibly more business than we can handle if market conditions regain a sane level.—J. W. Wooley, Oshkosh Manufacturing Company, Oshkosh, Wis.

pany has incorporated with a capital of $100,000, to manufacture motors, etc. Incorporators: W. H. Apgar, Trenton; William McElroth, East Radford, Va.; and L. S. Randolph, Blacksburg, Va.

WEST NEW YORK, N. J.—Hercules Storage Battery Company has incorporated with a capital of $20,000 to manufacture storage batteries. The incorporators are A. J. Wiencke, M. Wiencke and A. J. Ellis.

WEST ORANGE, N. J.—Thomas A. Edison, Inc., Lakeside avenue, has had plans prepared for the construction of a new one-story power house, about 100x100 feet. M. Arthur Wolff is engineer for the company.

ALTOONA, PA.—Electrification of the main line of the Pennsylvania Railroad between Altoona and Bellwood is under consideration by railroad engineers. It is planned to use the water power of the Alleghanies to move the trains.

CLEARFIELD, PA.—Electric Supply Company has incorporated with a nominal capital of $5000, to manufacture electric supplies. W. W. Wrigley is the principal incorporator.

ERIE, PA.—Erie Forge Company, Fifteenth and Cascade streets, has had plans prepared for the construction of a brick power plant. Day & Zimmerman, 611 Chestnut street, Philadelphia, are the engineers.

HARRISBURG, PA.—Council passed an ordinance providing for the installation of a new electric-lighting system at Riverside.

HUGHESVILLE, PA.—Citizens' Electric Light & Power Company has made application to the Public Service Commission for permission to issue bonds for $10,000 for improvements and extensions.

MARCUS HOOK, PA.—Benzol Products Company is making rapid progress in the construction of its new main switch and transformer house. The work will cost $10,000.

NEW CASTLE, PA.—New Castle Electric Company has made application to the Public Service Commission for permission to issue bonds to the amount of $20,000 to provide for improvements, extensions, etc.

PHILADELPHIA, PA.—Department of Safety is receiving bids for furnishing electric lamps, and for lighting, extinguishing, cleaning, repairing and maintaining such lamps for lighting the streets, avenues, boulevards, alleys, wharves, parks and public places of the city from Jan. 1 to Dec. 31, 1918. Specifications may be obtained from William H. Wilson, director, Room 616 City Hall.

PHILADELPHIA, PA.—Pennsylvania Railroad has had plans prepared for the construction of a two-story brick signal tower at Grays Ferry.

PHILADELPHIA, PA.—H. O. Wilbur, Third and New streets, has awarded a contract to William Steele & Sons Company, 30 South Fifteenth street, for the erection of an addition to his power house.

READING, PA.—Metropolitan Edison Company has secured a contract from the Philadelphia & Reading Railway Company for furnishing power for the operation of its locomotive and car shops in the northern section of the city to the amount of 1000 horsepower. The company is planning to supply this power direct from the West Reading power plant, and to do this it will be necessary for the company to extend its 13,000-volt transmission line now running as far as the works of the Carpenter Steel Company.

SHARON, PA.—Shenango Valley Electric Light Company has made application to the Public Service Commission for permission to issue bonds for $40,000 for improvements.

WAYNESBORO, PA.—Bell Telephone Company is planning for improvements in its system at Blue Ridge Summit to cost about $4000. W. J. C. Jacobs is manager.

NORFOLK, VA.—Virginia Railway & Power Company has awarded a contract to J. H. Pierce, Law building, for the construction of a one-story substation on Forty-seventh street.

SPRINGWOOD, VA.—Jasper Miller, Charlotte, N. C., is planning for the erection of a hydro-electric plant to furnish power for the operation of the proposed new local cotton mill.

CHARLESTON, W. VA.—H. & S. Electric Company has incorporated with a capital of $50,000, with Joseph Herzstam, Sidney Kusworm, H. R. Stapp, Kathleen Stapp and H. W. Linard the incorporators.

DATES AHEAD.

Electrical Supply Jobbers' Association. Next meeting, Hotel Sinton, Cincinnati, Ohio, November 13-15. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago.

CHARLESTON, W. VA.—West Virginia Water & Electric Company will build a one-story power house addition, about 46x75 feet. James Montgomery, Coyle & Richardson building, Charleston, is the architect.

FAIRMONT, W. VA.—Monongahela Valley Traction Company is making rapid progress in the construction of its power house, which will include a boiler room, 115x150 feet, turbine room, 50x175 feet, and switch room, 25x175 feet.

HOLLY HILL, S. C.—Holly Hill Electric Service Company has incorporated with a capital of $10,000. The incorporators are S. P. Wells, B. R. Bennett and R. G. Carson.

PINEVILLE, W. VA.—Wyoming Telephone Company, recently incorporated, is planning for improvements in its 50-mile telephone line.

WALHALLA, S. C.—Hetrick Hosiery Mills is planning for the electrification of its local plant.

DUBLIN, GA.—City is considering plans to enlarge the electric lighting and power plant.

JACKSONVILLE, FLA.—City Commission is planning for the construction of a new 6000-volt cable from its substation to the plant of the Hillyer-Sperring-Dunn Company on South Side. The Commission is also planning for extensions in its electric lighting system to South Jacksonville. Additional machinery will be installed in the electric lighting plant to cost $65,000 to increase the capacity to 12,000 kilowatts to supply the cantonment at city.

NORTH CENTRAL STATES.

AKRON, O.—Northern Ohio Traction & Light Company, Hamilton Building, will let contract for a train shed and underground subway on North Main street. Architect, F. C. Warner, 767 Hippodrome Annex, Cleveland, O.

CINCINNATI, O.—Automatic Electrical Devices Company has been incorporated with a capital of $10,000 by Clarence E. Ogden.

MANSFIELD, O.—National Electric & Construction Company has been incorporated with a capital of $10,000 by Frank Nattox.

INDIANAPOLIS, IND.—Indianapolis Street Railway Company will extend Bismarck Avenue street car line one mile.

WAUKEGAN, ILL.—City officials plan installing a municipal lighting plant and a filter system in one building.

DETROIT, MICH.—Electric Utilities Company has incorporated with a capital of $20,000. The incorporators are D. C. Seymour, L. R. Wilbur, F. A. Tilton.

KALAMAZOO, MICH.—Michigan State Telephone Company will erect two additional copper wire circuits between Kalamazoo and Grand Rapids. This will give the company another phantom circuit as well. A. W. Robb, general manager, 318 South Burdich street.

KENOSHA, WIS.—Wisconsin Gas & Electric Company will extend the power and generating and transmission system at Racine and throughout the southern part of Wisconsin.

OSHKOSH, WIS.—Architect William Baehr, 122 South Michigan avenue, Chicago, has been commissioned to prepare plans for the erection of an addition to the electric lighting plant to be 90x100.

MONTEVIDEO, MINN. — Northern States Power Company will erect a brick two-story building, 25x40 feet.

BOYDEN, IA.—Farmers north of here held a meeting and decided to organize a company to build an electric line for furnishing light and power. The cost of the line will be $5000, of which $3000 is already guaranteed. VeenSchoten Brothers, of the Boyden plant, are to furnish the service. The line is to cover 11½ miles and work is to be started at once, so that it will be completed before winter. Address VeenSchoten Electric Light Company.

BURLINGTON, IA.—Efforts are being made to extend electrolier system of Burlington. Martin Bruhl, owner of Bruhl Grand Theater, is working on a proposition to extend the curb lights from Jefferson street up Third street to Columbia street, a distance of two blocks. Another committee is interested in extending electroliers from Jefferson street to the new bridge, on Main street, a distance of four blocks.

DUNBAR, IA.—A bond issue of $7000 for the installation of an electric lighting system carried.

DES MOINES, IA.—Council has been instructed to install special designs of electroliers.

SPILLVILLE, IA.—Spillville Electric Light Company has sold out its business here, exclusive of machinery, to Mr. Latimer, of Calmar, Ia. Mr. Latimer recently set up poles and wire for transmission of electric light and power to Spillville, Ft. Atkinson and Festina, and now he has a large force of men at this work. The power for this line will be supplied from Clermont, Ia., and perhaps also from the Upper Iowa Power Company's plant near Decorah.

STOCKTON, IA.—Mud Creek Telephone Company, of Scott and Cedar counties has been incorporated to erect a line for the farmers. John Dohrmann is president and Henry Klohn, secretary.

KANSAS CITY, MO.—Kansas City Light & Power Company has purchased 25 acres on the Missouri River and will build a power plant to cost $4,000,000. Equipment will bring total cost up to $10,000,000.

ST. JOSEPH, MO.—Western Union Telegraph Company will improve its plant at a cost of more than $100,000 and lay underground conduits, string cables, and install apparatus at its office to take care of anticipated business here for 25 years.

SHELTON, NEB.—Shelton has signed a contract with the Central Power Company, of Grand Island, for an ornamental lighting system to be installed on Main street in the business section of the town.

WAYNE, NEB.—City Council has bought a new engine and other necessary equipment to establish a second electric lighting system for the accommodation of the State Normal and any other consumers wishing to use an alternating current.

HIGHMORE, S. D.—Citizens have voted to issue bonds with which to buy an electric lighting plant.

MADDOCK, N. D.—Bids will be received Nov. 5 for the purchase of $7000 electric lighting bonds.

WILLOW CITY, N. D.—Minot Electric Company has been granted franchise for electric lighting plant, to be constructed here and ready for operation by Jan. 1.

SOUTH CENTRAL STATES.

WHITESBURG, KY.—W. A. Daniels is reported contemplating the construction of a street railway here with extensions to West Whitesburg and other points.

MONTGOMERY, ALA.—Montgomery Light & Traction Company will erect an extension of its street railway in connection with service to Camp Sheridan.

EARLE, ARK.—Earle Light, Water & Ice Company has increased its capital from $15,000 to $60,000.

JONESVILLE, LA.—City will erect an electric lighting plant for municipal light and power. Machinery has been ordered.

GOOSE CREEK, TEX.—N. L. Nelson, of Sour Lake, manager of the water plant, will establish a light and water system here.

WESTERN STATES.

TROY, MONT.—Franchise has been granted the Snowstorm Mining Company for electricity. Owner, Kootenai Light & Power Compny.

CLOVIS, N. M.—State Line Utilities Company has secured from the Board of County Commissioners a franchise to run a high tension electric power line from the company's power line at Texico to Clayton and Portales.

SALT LAKE CITY, UTAH.—Oregon Short Line Railroad is planning to spend about $1,000,000 for building about 40 miles of feeder lines in northern Utah and southern Idaho. Specifications provide for an extension of 3.85 miles to Baker spur north of Brigham and 9.65

miles from Garland to Beaver River City. Other improvements are to be made in southern Idaho.

BOISE, IDA.—Sealed bids will be received up to Nov. 6 for $1878 in electric lighting bonds. The proceeds will be used for installing an ornamental lighting system.

BONNERS FERRY, IDA.—Bonners Ferry Planing Mill recently burned at a loss of $40,000. The mill will be rebuilt at once and it is proposed to install a 600-horsepower turbine engine direct connected to a dynamo, with individual motors for the various machines in the mill.

SEATTLE, WASH.—City Council has voted to expend $10,000 for rolling stock for the municipal railway.

SEATTLE, WASH.—The industrial bureau of the Chamber of Commerce and Commercial Club announces that plans have been completed by the Cooley Manufacturing Company of this city to manufacture practically every piece of equipment used in finishing Seattle vessels. Fittings will be electric lighting fixtures. The first unit of the plant is to be a $20,000 brass foundry and shop.

TACOMA, WASH.—A transformer station is being erected at the United States Army station at Camp Lewis. Three 55,000-volt wires will lead into the station.

TACOMA, WASH.—Ordinance has been introduced in the city council authorizing the commissioner of light and water to purchase $12,000 worth of consuming devices, specified as heaters, ranges, water heaters, etc., and authority given to call for bids on 50,000 pounds of copper wire.

TACOMA, WASH.—Orders have been received by the construction quartermaster at Camp Lewis for the construction of 175 buildings at a cost of $112,000, to house 6200 men who will be assigned to the training battalions. Considerable electrical equipment will be required.

DALLES, ORE.—Oregon Power Company is making some important improvements in its plant, including installation of a new 1000-horsepower engine.

BAKERSFIELD, CAL.—Mojave Lighting District has been incorporated and bids have been called for by the Board of Supervisors to be opened Nov. 5 for the installation of a lighting system.

EL SEGUNDO, CAL.—Southern California Edison Company has applied for an electric franchise in this City.

LIVINGSTON, CAL.—Board of Trade has decided to improve the lighting system. At present there are 11 100-candlepower street lights. For the first year the work will be in the hands of W. T. White, J. M. Landram and E. G. Adams, all trustees.

MEDFORD, ORE.—California-Oregon Power Company will open its power plant at Copco, Cal., about Dec. 1, which has been under construction for three years. Copco was selected because by nature it is an ideal power plant site, the Klamath River at that point flowing through a narrow gap between two hillsides, the spanning of which was necessary to provide a perfect natural reservoir. The plant represents an investment of $2,000,000 and will open with generation of 25,000 horsepower and be increased to 50,000 horsepower by a subsidiary station a quarter of a mile down the river.

LOS ANGELES, CAL.—California Railroad Commission has authorized the Southern Sierras Power Company to operate in Blythe, Cal.

MANTECA, CAL.—Sierra & San Francisco Power Company is erecting a transformer station here to supply current for the Spreckels Sugar Company's refinery.

MOJAVE, CAL.—Proposition to issue bonds for an electric lighting district carried and bids will be opened by the Board of Supervisors Nov. 5.

OAKLAND, CAL.—General Electric Company has awarded a contract for the construction of a three-story brick factory building at Sixteenth and Campbell streets to be used by the Oakland Mazda Lamp Company for manufacturing Mazda lamps. The building will cost about $85,500.

SAN DIEGO, CAL.—Sealed bids will be received by the City Council to Nov. 5 for a franchise for electric transmission lines along the public highways of the county outside of incorporated cities, as per an application made by the San Diego Consolidated Gas & Electric Company.

SAN FRANCISCO, CAL.—Calistoga Electric Company, operating an electric lighting business at Calistoga, has removed its headquarters from Oakland to this city.

SAN FRANCISCO, CAL.—Pacific Telephone & Telegraph Company has filed with the California Railroad Commission applications to operate in Marysville, Paso Robles, Stockton and Watsonville, Cal.

SAN FRANCISCO, CAL. — Roberts Manufacturing Company, of this city, was the lowest bidder for the installing of electric lighting fixtures in the northwest wing of the San Francisco Hospital, its bid being $6216.

SAN FRANCISCO, CAL.—The large power plant erected some years ago by the South Yuba Power Company on the South Fork of the Yuba River, near Nevada City, Cal., is now being "scrapped" and sold in this city.

SAN FRANCISCO, CAL.—United Light & Power Company, represented by F. C. Riley and G. W. Gilbreth, of Los Angeles, has applied to the California State Water Commission for permission to appropriate 15 cubic feet per second from the waters of San Gabriel River in Los Angeles County for use in generating electric power for commercial purposes. Power is to be generated by impulse wheels direct connected to electric generators. A total fall of 1280 feet will be secured and 10,000 horsepower will be generated. The proposed work includes the driving of a tunnel and pipe line two and one-half miles long, the construction of a dam 200 feet high and 500 feet long. Construction is to be completed in two years and the entire appropriation of water is to be utilized within five years.

SEBASTOPOL, CAL.—Pacific Gas & Electric Company is to install a new street lighting system here.

INCORPORATIONS

CHICAGO, ILL.—Dearborn Electrical Construction Company. Capital, $30,000. Incorporators: C. S. Knudson, F. H. Bowen and L. E. Delman.

JERSEY CITY, N, J.—General Appliance Company of America. Capital, $50,000. To manufacture telephone accessories, etc. Incorporators: William Fitzgerald, Maximilian Weil, and Henry Soibel, New York.

NEW YORK, N. Y.—E. Rothschild, Inc. Capital, $10,000. To manufacture special electric clocks for watchmen's service. Incorporators: A. L. Stock, and E. and H. J. Rothschild, 277 West Fourth street.

BROOKLYN, N. Y.—Continental Battery Company. Capital, $5000. To manufacture electric batteries. Incorporators: A. T. and J. R. McCafferty and E. Ziegler, 620 West One Hundred and Thirty-fifth street.

NEW YORK, N. Y.—Car Locater Light Company. Capital, $10,000. To manufacture electric lamps, locaters, and other electric devices. Incorporators: P. and R. M. Loewenthal and C. H. Low, 30 East Forty-second street.

NEW YORK, N. Y.—Degnon Aqueduct Construction Corporation. Capital, $25,000. To engage as engineers for the construction of electric railways. Incorporators: M. J. Degnon, R. P. Gustin, and A. A. Stuart, 68 Hunters Point avenue.

NEW YORK, N. Y.—Mayo Engineering Company, Inc. Capital, $200,000. To engage as electrical and mechanical engineers. Incorporators: G. F. Kerr, V. J. Mayo, and J. S. Bernstein, 233 Broadway.

NEW YORK, N. Y.—F. P. Mansbendel & Company, Inc. Capital, $5000. To engage in an electrical engineering business. Incorporators: E. W. F. Mammen, F. P. Mansbendel, and J. S. Leach, 576 Twenty-sixth street, Brooklyn.

JEFFERSON, N. C.—Ashe Telephone Company. Capital, $25,000. L. L. Perkins and E. Perkins.

CLEVELAND, O.—Brookside Electric Company has incorporated with a capital of $5000. The incorporators are Paul Jung, Mable Rose, J. B. Rose, Samuel Rose and Max L. Rose.

YOUNGSTOWN, O.—Electrical Metals & Manufacturing Company, Capital, $150,000. Incorporators: Frank P. Pyle, Paul H. Stambaugh, William M. Henderson, H. H. Wickham and William Schneider.

PORTLAND, ORE.—Stubbs Electric Company has incorporated with a capital stock of $50,000.

SAND SPRINGS, OKLA.—Star Telephone Company. Capital, $20,000. Incorporators: H. A. Davis, H. J. Davis and Benjamin G. Conner.

PORTLAND, TENN.—Portland Electric Company. Capital, $10,000. To generate power for industrial service. Incorporators: R. D. Noore, W. C. Skaggs, George W. Moore, Portland.

GRETNA, VA.—Gretna Telephone Company. Capital, $5000. Incorporators: R. T. Ramsey, president, and A. C. Quarles, secretary and treasurer.

SEATTLE, WASH. — Electric Vehicle Company, Inc. Capital, $5000. Incorporators: O. L. Willett and M. M. Preber.

KAHLOTUS, WASH. — Kahlotus & Page Telephone Company. Capital, $25,000. Incorporators: John A. Steele, E. L. Cline and E. J. Gilleland.

BLUEFIELD, W. VA.—National Armature & Electric Works. Capital, $25,000. To engage in general electrical repair business.

SUMMERSVILLE, W. VA.—Summersville Telephone Company. Capital, $5000. To operate and maintain a telephone exchange. Incorporators: John W. Murphy, Joseph F. Sebert, and George A. Rador, Gilboa, W. Va.

PATENTS EXPIRED.

The following United States electrical patents expired on October 23, 1917:

660,119. Alarm Appliance for Refrigerator Fans. J. H. McGurty, Jersey City, N. J.

660,124. Telephone System. L. Schmidt, Weehawken, N. J.

660,134. Automatic Circuit-breaker and Closer. W. B. Watzel and F. L. Shekell, Washington, D. C.

660,138 and 660,139. Thermo-electric Cell. E. F. Yost and W. H. Smith, New York, N. Y.

660,152. Electric Welding Tongs. J. R. Duncan, Indianapolis, Ind.

660,154. Receptacle for Incandescent Lamps. P. H. Fielding, New York, N. Y.

660,155. Apparatus for Controlling Mechanism of Moving Vessels or Vehicles. B. A. Fiske, U. S. Navy.

660,156. Method of Controlling Moving Vessels or Vehicles. B. A. Fiske, U. S. Navy.

660,199. Telautograph or Facsimile Telegraph. A. Pollak, Szentes, Austria-Hungary.

660,217. Electric-motor Wheel. C. E. Isbills, Passaic, N. J.

660,263. Electric Linotype Machine. A. W. Storm, Ramsey, N. J.

660,268. Indicator. C. L. Clarke, Mount Vernon, N. Y.

660,271. Insulating Knob for Electric-light Wiring. R. H. Henderson and J. G. Henderson, Chicago, Ill.

660,305. Thermo-electric Battery. J. Oliver, Memphis, Tenn.

660,313. Lightning Arrester. C. J. Reed, Philadelphia, Pa.

660,320. System of Electrical Distribu[illegible]. I[illegible]ng, Philadelphia, Pa.

660,340. Safety Cut-out for Electric Circuits. J. Sachs, Hartford, Conn.

660,341. Safety Fuse. J. Sachs, Hartford, Conn.

660,375. Electric Battery. F. K. Irving, Newark, N. J.

660,385. Self-winding Electric Clock. A. J. Madden, Prahran, Victoria.

660,393. Electric Arc Lamp. J. J. Rathbone, London, England.

660,396. Electric Regulator. C. W. Richards, Needham, Mass.

660,459. Slot Wedge for Dynamo-electric Machines. H. G. Reist, Schenectady, N. Y.

660,470. System of Signaling. E. J. Silkman, Baltimore, Md.

660,475. Manufacture of Incandescing Electric Lamps. W. H. Voelker, London, England.

660,483. Transmission of Power. E. J. Berg, Schenectady, N. Y.

660,502. System of Motor Control. A. S. Garfield, Paris, France.

660,534. Regulating Dynamo-electric Machines. C. P. Steinmetz, Schenectady, N. Y.

660,539. Coin-controlled Electric-shock Machine. B. M. Davis, Chicago, Ill.

Reissue. 11,865. Method of Insulating Electric Conductors. N. Tesla, New York, N. Y.

Financial News and Comment

COPPER MARKET.

No decisive action has been taken by the copper consumers' committee, working in co-ordination with the producers' committee, concerning future deliveries of copper to manufacturers. Deliveries being made to consumers are those under previously-made contracts, at contract prices, which are considerably above the Government figure of 23.5 cents. Government demands for copper, and, that required for export to our allies, are being supplied, but no new contracts with producers are being made. Copper required for war purposes and that required to satisfy existing contracts with consumers absorb the current production. Copper in the hands of dealers is reported as selling at 26 to 28 cents, mostly in small lots. With consumers it is not so much a question of price as it is a matter of getting the copper. Scrap copper and other copper wastes are being gathered in, and it is understood the War Industries Board will fix the price for such supplies. Exports of copper for August amounted to 94,658,500 pounds, which is considerably in excess of July exports. Exports for 1917 up to August 31 were over 25,000 tons greater than for the entire year of 1915. This increased demand by our allies, the tremendous requirements of our own government, and those of our domestic industries indicate how important it is that copper mining be relieved of all interference intended to cripple and diminish production.

Reports of Earnings.

NORTHERN STATES POWER.

An increase of 15.6 per cent in gross earnings and 12.7 in net earnings is shown by the report of the company for August, compared with August, 1916. Both the net and gross increase are larger proportionately than the increases for the year ended Aug. 31. Comparative figures follow:

August—	1917	Increase.	Pct. inc.
Gross earnings..	$ 526,391	$ 82,409	15.6
Net earnings....	261,551	33,253	12.7
Year ended Aug. 31—			
Gross earnings..	6,776,045	1,031,339	15.2
Net earnings....	3,576,040	374,743	10.4

TWIN CITY RAPID TRANSIT.

	1917.	1916.
August gross .....$	848,478	$ 849,967
Net	276,051	324,779
Surplus after taxes and charges	113,639	180,045
Eight months' gross..	6,882,599	6,740,241
Net	2,334,495	2,562,274
Surplus after taxes and charges	1,145,401	1,409,107

AMERICAN POWER & LIGHT CO.

Earnings of all subsidiary companies of American Power & Light Company, intercompany charges eliminated, compare as follows:

	1917.	1916.
August gross .....$	864,728	$ 795,673
Net after taxes.....	366,663	360,991
Twelve months' gross.	10,997,727	9,965,194
Net after taxes.....	4,754,608	4,588,308

PHILADELPHIA COMPANY.

Electric Light and Power Department:

	1917.	1916.
August gross .....$	734,712	$ 524,049
Net	157,509	110,677
Five months' gross...	3,512,968	3,627,503
Net	1,011,540	.....
Street Railway Department:		
August gross .....$	1,199,995	$1,139,367
Net	316,293	274,819
Five months' gross....	6,056,043	5,713,144
Net	1,777,393	1,635,468

AMERICAN PUBLIC UTILITIES.

Earnings of Wisconsin-Minnesota Light & Power Company, subsidiary of American Public Utilities Company, for twelve months ended August 31, compare as follows:

	1917.	1916.
Gross earnings.....$	1,574,686	$1,234,914
Net aft. tax and main.	810,922	662,797
Sur. after charges....	542,178	*.....
Bal. aft. pfd. div.....	271,978	*.....

*Not given.

BYLLESBY COMPANIES.

Combined earnings of all Byllesby utility properties for the month of August and for the year ended August 31, compared with corresponding previous periods, are reported as follows:

Month of August.	1917.	1916.
Gross earnings....$	1,392,928	$ 1,243,490
Net earnings	626,604	578,576
Year ended Aug. 31.		
Gross earnings.....	18,839,972	16,529,035
Net earnings	8,657,641	8,337,968

ELECTRIC BOND AND SHARE.

Subsidiaries of Electric Bond & Share Company report earnings as follows:

Carolina Power and Light Company:

	1917.	1916.
August gross .....$	71,866	$ 63,086
Net after taxes.....	24,783	18,617
Total income	24,783	18,617
Surplus after chgs.....	11,552	4,232
Twelve months' gross...	879,594	755,137
Net after taxes.....	316,545	288,681
Total income	426,195	365,231
Surplus after chgs.....	253,669	199,127

Asheville Power & Light Company:

	1917.	1916.
August gross .....$	47,266	$ 38,247
Net after taxes	23,600	14,067
Surplus after chgs.....	18,815	9,858
Twelve months' gross...	492,273	447,763
Net after taxes	210,612	193,174
Surplus after chgs.....	156,682	142,613

Yadkin River Power Company:

	1917.	1916.
August gross .....$	38,357	$ 39,762
Net after taxes	26,387	29,644
Surplus after chgs.....	12,006	14,743
Twelve months' gross...	480,925	391,052
Net after charges.....	355,539	275,096
Surplus after chgs.....	179,931	88,514

WISCONSIN-MINNESOTA LIGHT & POWER COMPANY.

Earnings for twelve months ended June 30 are as follows:

	1917.	1916.
Twelve months gross..	$1,526,247	$1,226,650
Net after taxes.....	781,786	633,432
Surplus after charges.	524,089	*.....
Balance after preferred dividends	272,389	*.....

*Not given.

The Northwestern Electric Company, Portland, Ore., in its financial statement for August, shows a margin of over $7,000 in gross earnings as compared with the same month of 1916. Gross earnings from electric and steam heat sales and miscellaneous sources were $58,801, as compared with $51,750 last year. Operating expenses increased from $23,327 last year to $30,504. Net earnings were therefore $28,298, as compared with $28,423. The 1917 surplus was $11,482, after fixed charges were substracted, an increase over last year's surplus of $10,918.

At a recent annual meeting of the stockholders of the Conestoga Traction Company, Lancaster, Pa., the following Board of Directors was elected: Congressman W. W. Griest; Dr. T. C. Detwiler; Dr. E. S. Snyder; John C. Carter, president Conestoga National Bank; P. E. Slaymaker, president Peoples' Trust Company; John Hertzler, president Lancaster Trust Company; J. Frederick Sener; J. W. B. Bausman, president Farmers' Trust Company; John M. Groff, all of Lancaster; R. E. Griscom and John S. Jenks, Jr., Philadelphia; David A. Howe, Williamsport; H. C. Schock, Mount Joy; E. G. Connette and George Bullock, New York City.

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Oct. 16.	Bid Oct. 23.
Adirondack Electric Power of Glens Falls, common	..	14	15
Adirondack Electric Power of Glens Falls, preferred	6	66	55
American Gas & Electric of New York, common	10+extra	100	95
American Gas & Electric of New York, preferred	6	44	42
American Light & Traction of New York, common	..	234	220
American Light & Traction of New York, preferred	6	100	99
American Power & Light of New York, common	4	53	56
American Power & Light of New York, preferred	6	76	75
American Public Utilities of Grand Rapids, common	..	25	24
American Public Utilities of Grand Rapids, preferred	6	59	58
American Telephone & Telegraph of New York	..	114	..
American Water Works & Elec. of New York, common	..	4½	4½
American Water Works & Elec. of New York, particip	7	12	11
American Water Works & Elec. of New York, first preferred	..	63	62
Appalachian Power of Bluefield, common	..	3	2
Appalachian Power of Bluefield, preferred	7	25	25
Cities Service of New York, common	+extra	215	218
Cities Service of New York, preferred	6	78¼	77¾
Commonwealth Edison of Chicago	8	113	109
Comm. Power, Railway & Light of Jackson, common	4	43	38
Comm. Power, Railway & Light of Jackson, preferred	6	74	68
Federal Light & Traction of New York, common	..	8	6
Federal Light & Traction of New York, preferred	..	40	..
Illinois Northern Utilities of Dixon	6	75	75
Middle West Utilities of Chicago, common	2+2 extra	38	34
Middle West Utilities of Chicago, preferred	6	63	62
Northern States Power of Chicago, common	ex div. 7	71	71
Northern States Power of Chicago, preferred	ex div. 7	93	92
Pacific Gas & Electric of San Francisco, common	5	39½	38
Pacific Gas & Electric of San Francisco, preferred	6	86	85½
Public Service of Northern Illinois, Chicago, common	7	83	83
Public Service of Northern Illinois, Chicago, preferred	6	90	..
Republic Railway & Light of Youngstown, common	4	27	24
Republic Railway & Light of Youngstown, preferred	6	63	63
Standard Gas & Electric of Chicago, common	..	6½	6
Standard Gas & Electric of Chicago, preferred	6	29	28
Tennessee Railway, Light & Power of Chattanooga, common	..	3	3
Tennessee Railway, Light & Power of Chattanooga, preferred	6	22	13
United Light & Railways of Grand Rapids, common	4	35	33
United Light & Railways of Grand Rapids, preferred	6	65	63
Western Power of San Francisco, common	..	10	10
Western Power of San Francisco, preferred	6	49	47
Western Union Telegraph of New York	extra	85⅛	88
Industrials—			
Electric Storage of Philadelphia, common	4	53½	51
General Electric of Schenectady	8	134¾	..
National Carbon of Cleveland, common	8	*68¼	68
National Carbon of Cleveland, preferred	..	*130¾	130
Westinghouse Electric & Mfg. of Pittsburgh, common	5+extra	40⅛	42¾
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	56	56

*Last sale.